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ABSTRACT

This materials guide on mathematics instruction for limited-English-speaking students, contains sample instructional materials for teaching mathematical concepts and word problems, and sample lesson guides for lesson development. The emphasis is on adaptation of existing commercial and teacher-developed materials for use with this population. An introductory section discusses the relationship between language and mathematical activities, particularly in the context of the two approaches outlined here: (1) concept formation and application; and (2) use of word problems. Linguistic and mathematical considerations and procedures viewed as important in materials adaptation are outlined. The bulk of the document is devoted to guides for development of mathematics lessons integrating mathematics content and related English-as-a-Second-Language instruction. Content of the lessons focuses on relatively simple arithmetic and mathematical procedures. (MSE)

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LANGUAGE ORIENTATION TO MATHEMATICS TEACHING:

A MATERIALS BOOK

Systems Management Associates Inc.

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LANGUAGE ORIENTATION TO MATHEMATICS TEACHING:

A MATERIALS BOOK

Submitted by: Systems Management Associates, Inc.
Julius Jackson, President

Prepared by: Bilingual Mathematics Project
University of Miami - Subcontractor
P. O. Box 248074
Coral Gables, Florida 33124

Dr. Gilbert J. Cuevas

Dr. Philip H. Mann

Ms. Angeles Fleites
Ms. Rose Marie McClung
Ms. Brenda Walker

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FOREWORD

LANGUAGE ORIENTATION TO MATHEMATICS TEACHING

The Language Orientation to Mathematics Teaching focuses on specific curriculum, instructional, and materials development strategies that incorporate a language teaching component within the mathematics lesson. Emphasis is made on the adaptation of existing teacher and commercial materials. This approach is set forth in a set of five volumes, each addressing an aspect of the instructional process in mathematics for limited English proficient students. (LEP)

Volume One - A Process Approach provides an instructional and materials development/adaptation model to be used in mathematics with LEP students. Volume Two - A Curriculum Guide presents a frame work and procedures for adapting the existing curriculum to address identified critical competencies in mathematics for LEP students. Volume Three - A Materials Book contains sample instructional materials for teaching mathematical concepts and word problems as well as sample lessons for dealing with basic skills assessment issues. Volumes four and five are teacher's and trainer's guides respectively. Figure 1 contains the sequence and scope materials in the series, highlighting the present volume.

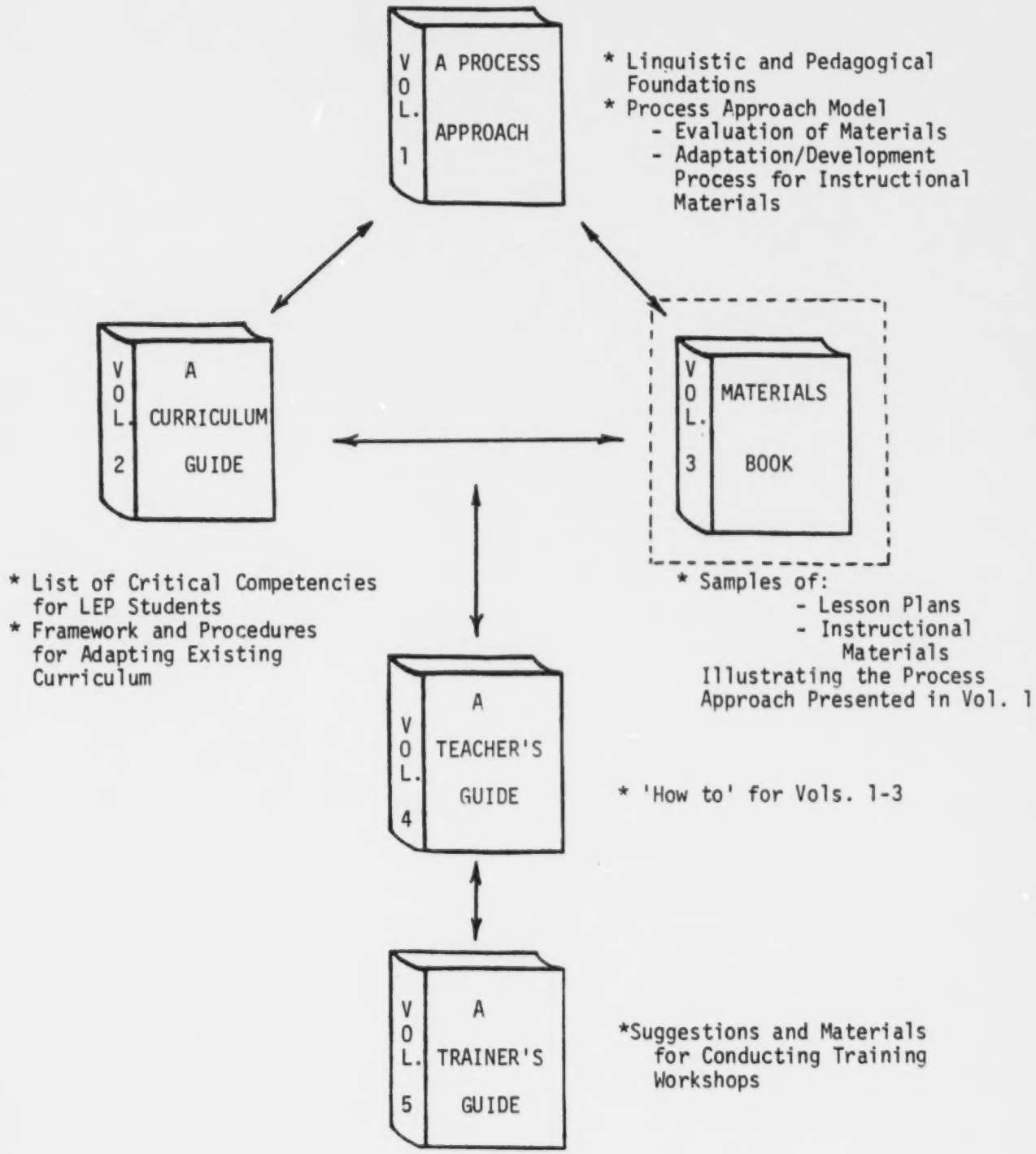

VOL. 1 A PROCESS APPROACH
* Linguistic and Pedagogical Foundations
* Process Approach Model
- Evaluation of Materials
- Adaptation/Development Process for Instructional Materials
VOL. 2 A CURRICULUM GUIDE
VOL. 3 MATERIALS BOOK
* List of Critical Competencies for LEP Students
* Framework and Procedures for Adapting Existing Curriculum
* Samples of:
- Lesson Plans
- Instructional Materials
Illustrating the Process Approach Presented in Vol. 1
VOL. 4 A TEACHER'S GUIDE
* 'How to' for Vols. 1-3
VOL. 5 A TRAINER'S GUIDE
*Suggestions and Materials for Conducting Training Workshops

Figure 1.- Language Orientation to Mathematics Teaching: Scope and Sequence

INTRODUCTION

It is widely accepted that one of the reasons for the language minority student's underachievement in school is his/her lack of mastery of English as a second language. This problem is compounded by the paucity of language related practice in mathematics programs for limited English proficient (LEP) students. More specifically, the difficulties LEP students experience in mathematics may stem from:

- a lack of mastery of prerequisite skills,
- the curriculum in the student's native country did not cover, or treated differently the particular concept/skill,
- a lack of knowledge of mathematics related vocabulary, or
- a lack of mastery of the grammatical structures which assist in the communication of meaning in a mathematics lesson/text.

In addition, each of the general content areas within the mathematics curriculum - concepts, operations, applications, word problems - appear to emphasize certain vocabulary and other language skills.

Instructional Orientations

Based on the above problems LEP students face in mathematics, two general Instructional Orientations or approaches have been developed. One deals with the teaching of concepts/applications; the other with word problems. A description of each follows:

Orientation I - Concepts/Applications

The following areas need to be addressed in order to incorporate second language teaching techniques, and to develop instructional activities/ materials appropriate for the LEP student.

a. Linguistic Focus

The linguistic focus needs to address the following:

1. Vocabulary for review - The review vocabulary list contains words that have already been taught. These words must be reviewed however, since they appear as part of the objective. The limited English proficient student needs to show understanding of the words before continuing on to a new concept.

2. Linguistic structures for review - Since mathematics text is frequently characterized by the use of verbs in the passive voice, the meaning and use of this verb form needs to be explained (e.g., is divided by). The meaning of relational terms, such as, greater than, more than, before, after, etc., should be included in instructional activities.

3. Vocabulary for development - The development vocabulary list contains words that are inherent in the linguistic aspects of the skill being taught. These are words that the student is most probably unfamiliar with, yet needs to master in order to achieve competency in the particular skill.

4. Linguistic structures for development - Certain mathematical terms and expressions are found in this list, as well as ordinary structures used in everyday language which may be unfamiliar to the student, but which facilitate the teaching of the skill. The introduction of these structures will aid in achieving competency in the particular skill by the student.

b. Mathematics Focus

The mathematics content of the lesson is described, and the mathematics vocabulary to be introduced is identified.

c. Sample Dialogue

Have students choose, give, point to an object in response to questions, requests, or instructions. Check understanding of terms and their use in the context of a sentence by rephrasing them objectively, questioning the students in English, or, as a last resort, translating them into the student's native languages.[2]

Have students practice responding to context appropriate questions, such as,

---

[2]Note - Translating assumes the availability of a bilingual teacher.

- What is the sum of the numbers?

- Explain how you computed the perimeter.

- What number does the abacus show?

- How many hundreds are there in nine hundred?

Orientation II - Word Problems

The following procedures should be followed in the adaptation of curriculum materials related to problem solving.

a. Linguistic Focus

1. Reading the problem

Spache and Spache (1973) recommend that students be taught a general procedure in problem solving:

- rapid reading for general understanding,

- a slower reading to identify details,

- oral restating of a problem in the student's own words.

2. Cueing - students should receive practice in the following:

- Different cues will result in the need for additional information or raise questions about assumptions that have to be made in order to solve a problem. Deciding what information needs to be used that is either stated in the problem or not explicit in the problem for arriving at a solution. Are there any distractors?

Example: If it takes 2 hours to drive to Hartford from New York City, how many minutes will it take to drive to Bridgeport which is half again the distance between New York City and Hartford.

The student must know that 60 minutes comprise an hour in order to solve this problem though nowhere in the problem does it give this information. The word "again" is a distractor. It is not necessary, yet it may confuse the student.

Organizing this information into components or segments.

3. Planning - students need practice in the following:

   - Review the language of the problem in order to determine what information is used in order to arrive at an expected solution.
   - What needs to be done first, next, before, or after, etc.
   - Is there a model for this type of problem that the student can use?
   - What are all of the alternative approaches to the solution of the problem?

4. Implementing - students need practice in the following:

   - Designing the format for the solution of a problem.
   - Computing the problem accurately to arrive at a solution.

The sample lesson guides presented illustrates instructional orientation for developing concepts and problem solving skills.

PURPOSE

The purpose of this volume is to give teachers ample lesson plans and instructional materials which address the Critical Competency areas identified in Volume II - A Curriculum Guide. The lesson guides and student materials given are to be utilized as illustrations of the procedures to be used with limited English proficient students in mathematics.

The volume is organized as follows:

a. Lesson guides - Instructional Orientation I:
   Concepts/Applications (with instructional materials)

b. Lesson guides - Instructional Orientation II:
   Word Problems (with instructional materials)

For each of the above sections, the lesson guides and instructional materials will be also classified in terms of appropriateness for grades K-1, 3, 5, 8, and 11.

Note: Some of the lesson guides were adapted from the Total Mathematics Program (TMP), Dade County Public Schools, Division of Elementary and Secondary Instruction, Miami, Florida.

INSTRUCTIONAL ORIENTATION I: CONCEPTS APPLICATIONS

LESSON GUIDES

Objective

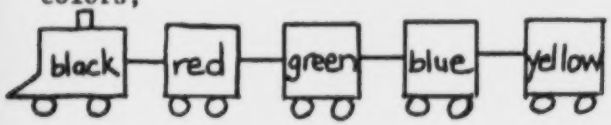
Kindergarten - 1st grade

Identify positions:
first, last, before, after, etc.
[N4.34]

The student will be able to identify position occupied by a certain object in reference to other objects.

Materials

Construction paper train, engine, and four cars, all in different colors,



to be placed on chalkboard.

Construction paper head bands, one each: black, red, green, blue, and yellow.

Flash cards for colors.

Linguistic Focus

Review

Vocabulary

Black	Blue
Red	Yellow
Green	

Development

Vocabulary

Engine	Last
Cars	Before
First	After

Structure

This is a/the _____.

It's a/the _____.

The _____ is _____.

What is it?

Where is it?

Mathematics Focus

The students should be able to determine the position of an object in reference to another object using the position words, first, last, before, after.

Sample Dialogue

Review

Using the color flash cards, the teacher will review the colors necessary for this lesson.

Flashing card.

T. This is yellow. It's yellow. What is it?

S. It's yellow.

The teacher will review all colors following this procedure prior to presenting the new lesson.

Sample Dialogue

Introduce

The teacher will put the train up on the board and say:

T. This is a train. It's a train. What is it?

S. It's a train.

T. This is the engine. It's the engine. What is it?

S. It's the engine.

T. The engine is first. It's first. Where is it?

S. It's first.

T. This is a car. It's yellow. It's last. (pointing at the yellow car) Where is it?

S. It's last.

T. The engine is first. It's first. The yellow car is last. It's last. (pointing)

S. The engine is first. It's first.
The yellow car is last. It's last.

T. Where is the engine?

S. It's first.

T. Where is the yellow car?

S. It's last.

T. The red car is after the engine. It's after the engine. Where is it? (pointing)

S. It's after the engine.

T. The yellow car is after the blue car. It's after the blue car. Where is it?

S. It's after the blue car.

T. The engine is before the red car. It's before the red car. Where is it?

S. It's before the red car.

T. The green car is before the blue car. It's before the blue car. Where is it?

S. It's before the blue car.

T. The green car is after the red car. It's after the red car. Where is it?

S. It's after the red car.

T. The green car is after the red car and before the blue car. It's after the red car and before the blue car. Where is it?

S. It's after the red car and before the blue car.

Follow-Up Activities

Five students will be called up to the front of the class. They will be given the construction paper headbands representing the train. Then the teacher will say:

T. I want the engine to come here and be first. I want the red car to stand after the engine. I want the blue car to stand after the red car.

and so on, until they are all lined up. Then the teacher will ask the class:

T. Where is the blue car?

S. The blue car is after the red car and before the green car.

T. Where is the engine?

S. The engine is first. It's before the red car.

The teacher will line up five students again. This time the teacher will ask individual students:

T. Where is the green car, Juanito?

S. The green car is last. It's behind the yellow car.

T. Where is the engine, Maria?

S. The engine is first. It's before the blue car.

Wrap-Up Dialogue

Referring once more to the train on the board.

T. The engine is first. It's <u>before</u> the red car. Where is it?

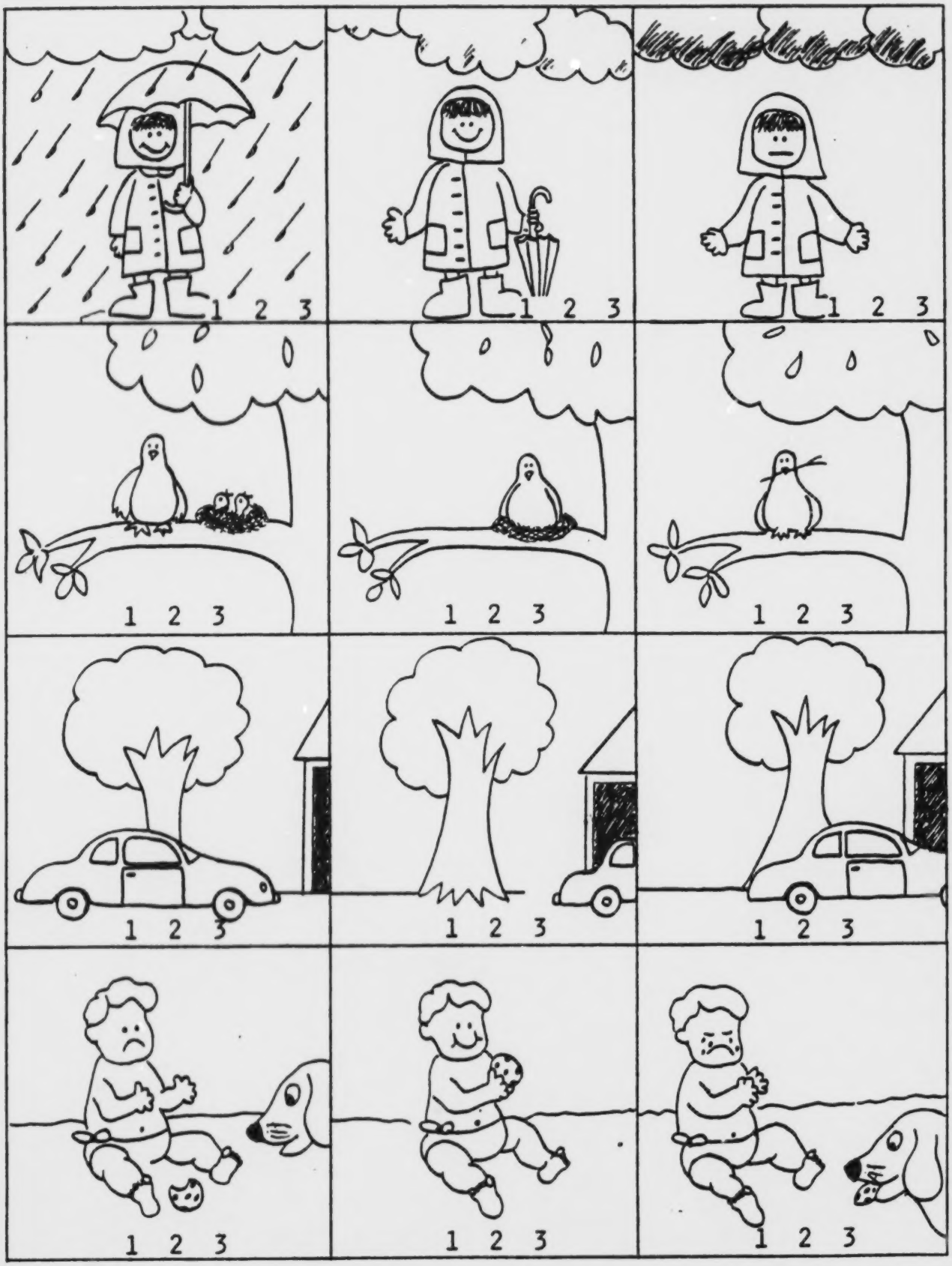
S. It's first. It's <u>before</u> the red car.

T. The yellow car is <u>last</u>. It's <u>after</u> the blue car. Where is it?

S. It's <u>last</u>. It's <u>after</u> the blue car.

T. The green car is <u>after</u> the red car and <u>before</u> the blue car. Where is it?

S. It's <u>after</u> the red car and <u>before</u> the blue car.


1 2 3
1 2 3
1 2 3
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1 2 3

Objective

Kindergarten - 1st grade

Compare size; shape:
same, different [G2.36]

The students will be able to compare objects and identify those which are the same size/shape, and those that are a different size/shape.

Materials

Pennies: 2 for each student
Nickels: 1 for each student
Uninflated balloons:
2 for each student, 1 round, 1 long.
Construction paper balloons
2 round 1 set for each
2 long student
1 string, 4 ft. long
stickers
tape or paper clips

Linguistic Focus

Review

Vocabulary

this, that, penny, nickel, round

Note:

Emphasize use of this for something they can touch. Emphasize that for something they point at.

Development

Vocabulary

these, coins, pennies, nickels, size, shape, same, different, balloons, round, long, big, small.

Note:

All oral language practice should proceed from large to small groups repetition to individual student repetition.

Structures

This _____ is the same _____(size, shape) as this _____.

These _____ (pennies, coins, nickels) are the same _____(size, shape) as these _____.

This _____ is different from this _____.
This _____ is _____ (big, small).
They are different.
They are the same.

It's _____.
They're _____. They're not _____.

Mathematics Focus

The students should be able to recognize and identify differences/similarities in shape and size of same type objects.

Sample Dialogue

Introduce

T. This nickel is the same shape as this penny. (holding up the coins) These coins are the same shape.

S. This nickel is the same shape as this penny. (holding up the coins) These coins are the same shape.

T. They're round. These coins are round.

S. They're round. These coins are round.

T. This nickel is big. This penny is small.

S. This nickel is big. This penny is small.

T. This nickel is different from this penny.

S. This nickel is different from this penny.

T. They're different. They're a different size. These coins are different.

S. They're different. They're a different size. These coins are different.

T. This is a balloon. These are balloons. Show me your balloons. (Students hold up the balloons)

T. The balloons are a different shape.

S. The balloons are a different shape.

T. This balloon is round.

S. This balloon is round.

T. This balloon is long.

S. This balloon is long.

T. They are a different shape. These balloons are a different shape.

S. They are a different shape. These balloons are a different shape.

Teacher now directs students to blow up the round balloon. Teacher walks around touching the balloons and saying:

T. These balloons are round.

S. These ballons are round.

T. They're the same shape. They're the same size.

S. They're the same shape. They're the same size.

This activity is repeated with the long balloon. Then the teacher uses her blown-up balloons to say:

T. They're a different shape.

S. They're a different shape.

Teacher then uses tape to place string on board as if it were a clothesline. Teacher then calls on students to come to the board and hang their balloons from the clothesline (use paper clips or tape). As students hang up their balloons they should be directed to compare them using the previously learned structures:

S. This balloon is round. This balloon is long. They're different. They're a different shape.

The teacher will now retrieve her money by selling her stickers. The students pay back the money as they are asked to say:

S. These coins are the same shape. They're a different size.

T. Show me the two coins that are the same size.

S. These pennies are the same size.

After successfully completing this individual dialogue, the students will receive a sticker in exchange for the coins.

Follow-Up Activity

The balloons that the children were asked to hang from the string are still on the board. Individual students, at least 7 or 8, will be asked to come up and pick two balloons that are the same shape as they say:

S. These balloons are the same shape.

Then 7 or 8 other students will come up and pick balloons that are a different size as they say:

S. These balloons are different. They're a different size.

Wrap-Up Dialogue

Using the coins, the teacher will say:

T. These pennies are the same size.

T. They're the same shape.

T. These pennies are the same shape and size.

S. These pennies are the same shape and size.

T. This nickel is round. This penny is round.

T. These coins are round. They're the same shape.

S. These coins are round. They're the same shape.

T. This nickel is big. This penny is small. These coins are different. They're a different size.

Sample Dialogue

Review

T. This penny is the same size as this penny.

S. This penny is the same size as this penny. (holding up their pennies)

T. This penny is the same shape as this penny.

S. This penny is the same shape as this penny.

T. They're round. They're the same shape.

S. They're round. They're the same shape.

T. They're round. They're not different. (Holding up both pennies)

S. They're round. They're not different. (Holding up both pennies)

Objective

Kindergarten - 1st grade

Compare mass: lighter, heavier

The student will be able to compare two objects for mass, and determine which one is lighter, and which one is heavier.

Materials

2 styrofoam cups for each student, smallest size.

Enough popcorn to fill one cup for each student.

Water (always available in a kindergarten classroom).

Sand - enough to fill one cup for each student.

Linguistic Focus

Review

Vocabulary

empty, more, less, full

Development

Vocabulary

lighter, heavier, weighs, cup, popcorn

Structures

This cup is _____ (empty, full).

These cups are _____. They are _____.

It's _____.

This cup is _____ (lighter, heavier) than this cup.

It weighs _____.

Which one weighs _____?

This one weighs _____.

What is it?

It's full of _____.

They're _____.

Mathematics Focus

The students should be able to determine the mass of two objects of equal shape by identifying which one is lighter or heavier.

Follow Up Activities

The teacher will now direct students to empty their water cup. Then the empty cup will be filled with sand.

Individual students will now have to decide and tell the teacher which cup is lighter and which is heavier. Successful completion of this activity will be rewarded by being allowed to eat the cup full of popcorn.

T. Show me your lighter/heavier cup and tell me about it. (all students should be allowed to respond)

S. This cup is lighter/heavier.

T. Good! You may eat your popcorn.

Wrap-Up Dialogue

T. This cup is full of sand. It's full of sand. This cup is full of popcorn. It's full of popcorn. This cup is heavier. This cup is lighter. Tell me about this cup, class.

S. It's full of sand. It's heavier.

T. Tell me about this cup, class.

S. It's full of popcorn. It's lighter.

This procedure should go from group to individual repetition.

Sample Dialogue

Review

Teacher holds up an empty cup.

T. This cup is empty. It's not full. It's empty.

S. (Holding an empty cup) This cup is empty. It's not full. It's empty.

T. (Teacher fills his/her cup with popcorn and says)
This cup is full. It's full of popcorn. What is it?

S. It's full of popcorn.

T. It's not empty. It's full. What is it?

S. It's not empty. It's full.

Introduce

Teacher holds 2 empty cups.

T. These cups are empty. They're empty. They're light. They're not heavy.

Teacher fills one of the demonstration cups with popcorn.

T. This cup is full. (showing popcorn cup)
This cup is empty. (showing empty cup)
This cup is heavier than this cup. It weighs more.
This cup is lighter than this cup. It weighs less.

Teacher then fills one cup for each student with popcorn.

T. This cup is full. Show me your full cup.

S. This cup is full. (raising full cup)

T. This cup is empty. Show me your empty cup.

S. This cup is empty. (raising empty cup)

T. This cup is heavier. Show me your heavier cup.

S. This cup is heavier. (raising full cup)

T. This cup is lighter. Show me your lighter cup.

S. This cup is lighter.

T. This cup is heavier than this cup.

S. This cup is heavier than this cup.

T. (calling on 7 or 8 individual students)
Juanito, show me your heavier/lighter cup. Tell me about it.

S. This cup is heavier/lighter (depending on the cue given by the teacher)

Teacher then fills students empty cups with water as well as his/her empty cup.

T. These cups are full. This cup is full of water. This cup is full of popcorn. This cup is lighter than this cup. (showing popcorn cup first and then water cup) This cup is heavier than this cup.

T. Show me your heavier cup and tell me about it.

S. This cup is heavier.

T. Show me your lighter cup and tell me about it.

S. This cup is lighter.

T. (to at least 7 or 8 individual students)
Juanito, show me your heavier/lighter cup and tell me about it.

Objective

Kindergarten - 1st grade

Compare area; volume: more, less, smaller (est), larger (est). [M2.12]

The student will be able to compare objects and identify those which are smaller, larger, etc.

Materials

3 cubes - small, medium, large

3 balls - small, medium, large

3 toy cars - small, medium, large

*3 construction paper circles - small, medium, large

* 3 construction paper squares - small, medium, large

* one set for each student

Duplicator masters with pictures of boats, apples, coins.

Linguistic Focus

Review

Vocabulary

shape, same, different, size, this, that

Note:
Emphasize use of this for something they can touch.
Emphasize use of that for something they point at.

Development

Vocabulary

more, less, smaller (est), larger (est), car, cube, square, circle

Structures

This/that is the same (size) (shape) as this/that one.

This/that _____ isn't the same (size) (shape) as this/that one.

This/that _____ is different from this/that one.

This/that _____ is (smaller) (larger) than this/that.

This/that _____ is the (smallest) (largest).

Which _____ is the (smallest) (largest) ?

Note:
All oral language practice should proceed from large to small group repetition to individual student repetition.

Mathematics Focus

The student should be able to recognize and identify differences in sizes of same objects. The student should be able to recognize and identify which is the largest/smallest of the same objects.

Sample Dialogue

Review

The teacher will give out three squares in different sizes to each student and holding them up, the teacher will say:

T. These squares are the same shape.

S. These squares are the same shape (the teacher will have them hold up the squares as they repeat.)

T. This square isn't the same size as this square. (holding up the largest and the smallest square).

S. This square isn't the same size as this square.

T. These squares are different sizes.

S. These squares are different sizes.

Sample Dialogue

Introduce

The teacher will give out three circles to each student in three different sizes. The teacher will stick three circles to the board and direct the students to place their three circles on their table in front of them. The teacher will point to the smallest circle on the board and say: This circle is the smallest. This circle is smaller than this circle. Please find your smallest circle, hold it up and say:

T. This circle is the smallest.

S. This circle is the smallest.

Pointing to the largest and smallest circles on the board, the teacher will say:

T. This circle is smaller than this circle.

T. This circle is the largest.

Directing the students to hold up their smallest and largest circle, the teacher will have the students repeat after him/her.

S. This circle is smaller than this circle.

S. This circle is the largest.

This activity will be repeated using the three sizes available.

At the end of this drill, the teacher will assess their conceptual and linguistic comprehension by having them hold up the appropriate circle as he/she says: "Show me your largest circle. Show me your smallest circle," etc.

The teacher will then repeat this activity using the cubes.

T. This cube is the smallest.

S. That cube is the smallest (pointing at cube in teacher's hand.)

T. This cube is larger than this cube.

S. (Pointing) That cube is larger than that cube.

T. This cube is the largest.

S. That cube is the largest.

Using the three cars, the teacher will have a student come up to the desk and pick up the largest car, hold it up and say:

S. This car is the largest car.

Another student will do the same with the smallest.

S. This car is the smallest car.

Another student will be asked to compare two cars and say:

S. This car is larger than this car,

or

S. This car is smaller than this car.

The same procedure will be used with the three balls and three other students.

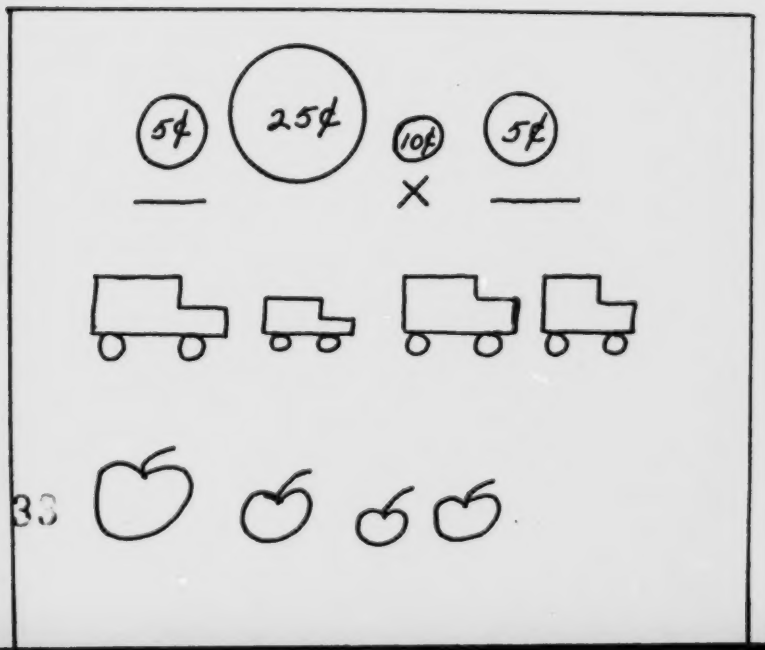
Follow-Up Activity

Use the dittos which have three rows:

1) now showing 4 coins (2 nickels, one dime, one quarter)

2) another row should have 4 apples (2 of the same size, another larger, and another smaller)

3) another row with 4 boats (2 of the same size, another larger, and another smaller). Have the students draw a line under things that are the same size in each row, a circle around the largest object on each row and a cross under the smallest object on each row.



Wrap-Up Dialogue

T. Today we learned about large and small. This cube is the largest cube, and this cube is the smallest cube.
Tell me what this ball is (holding up the largest ball).

S. That ball is the largest ball.

T. Tell me about this cube (the smallest).

S. That cube is the smallest cube.

T. Tell me about this car (the largest).

S. That car is the largest car.

T. Show me your smallest square and tell me what it is.

S. This square is the smallest square (holding it up.)

T. Show me your largest circle and tell me what it is.

S. This circle is the largest circle.

Objective

Kindergarten - 1st grade

Count money: pennies,
- 9¢
[NB.52]

The students will be able to count money, pennies up to 9.

Materials

Number cards 1-9

9 pennies for each student

9 balloons for each student

ESOL Level 3

Intermediate

Linguistic Focus

Review

Vocabulary

Numbers 1 - 9

Counting 1 - 9

Penny - Pennies

Development

Vocabulary

Let's, how many, left, have

Structures

Let's count.

How many _____ do you have?

I have _____.

How many _____do you have left?

You have _____.

Mathematics Focus

The student will be able to count pennies up to 9 and will be able to tell how many pennies he has left after the teacher removes 9 pennies from his set of 9.

Follow-Up Activity

The teacher will now "sell" the balloons to the students following this procedure.

T. Class, let's see if you know how many pennies you have left. (calling on a student)

T. Juanito, give me 2 pennies. How many pennies do you have left?

S. I have seven pennies.

T. Good! Give me your seven pennies. Here is your balloon.

T. Maria, give me 4 pennies. How many pennies do you have left?

S. I have five pennies left.

T. Good! Give me your five pennies. Here is your balloon.

This activity is to be repeated until all the students have "bought" a balloon.

Wrap-Up Dialogue

Teacher puts up her nine pennies on the board again.

T. I have nine pennies. Maria, come take 3 pennies. How many pennies do I have left, class?

S. You have 6 pennies left.

T. Yes, I have 6 pennies left.

To be repeated 5 or 6 times calling on individual students to take a certain number of pennies from the board while the class answers as a group how many pennies are left. The teacher always replaces the pennies removed by the students.

Sample Dialogue

Review

Teacher holding up number cards.

T. Let's count. Students repeat after teacher.

S. One, two, three, etc.

Individual students should be called upon to call out numbers for certain cards to make sure they can count and recognize number.

T. How many cards do I have? (showing 2 or 3 cards)

S. Two! or three! etc.

Repeat this procedure several times always going from group to individual repetition.

T. What number is this?

S. Five! (or whatever number the teacher holds up)

T. How many cards do I have?

S. Four! (or whatever group of cards the teacher holds up)

T. Now we are going to count pennies. Let's count them.

T. One, two, three, etc.

S. One, two, three, etc.

Introduce

Teacher gives each student nine pennies and keeps nine.

T. Let's count these pennies.

T. & S. One, two, three, etc. ... up to nine pennies.

T. I have 9 pennies. How many pennies do you have?

S. I have nine pennies! (class repetition)

T. How many pennies do you have? (calling on individual students)

S. I have nine pennies.

Teacher holds up her nine pennies and removes 3. The teacher counts the six remaining pennies.

T. How many pennies do I have?

S. You have six pennies.

The teacher calls a student up to the desk and takes 3 pennies away from his set.

T. How many pennies do you have?

S. I have six pennies.

Returning the three pennies.

T. How many pennies do you have?

S. I have nine pennies.

The teacher repeats this procedure with at least 7 or 8 other students, removing a different number of pennies from each set, helping them count the remaining pennies and then going through the dialogue.

T. How many pennies do you have?

S. I have _____ pennies.

Using special "dough" the teacher glues her nine pennies to the board, and he/she proceeds to remove a certain number or pennies, guiding the class to count the remaining pennies, then calling on individual students to answer.

T. How many pennies do I have?

S. You have _____ pennies.

This procedure should be repeated 6 or 7 times.

OBJECTIVE

Grade 3

Student will subtract a 3 digit number with regrouping

Materials

Chalkboard, chalk, duplicating masters with subtraction

ESOL Level 2

LINGUISTIC FOCUS

Review
Vocabulary

take away, subtract, difference, minus, top, bottom, column, ones, tens, hundreds, thousands.

Structures

What is _____ take away _____?

It is _____.

What is the difference between _____ and _____?

It is _____.

MATHEMATICS FOCUS

438
- 296

Sample Dialogue

T. (Teacher writes problem on the board)
What type of problem is this?

438
- 296

S. It is a subtraction example.

T. What does it tell us to do?

S. It tells us to subtract 296 from 438.

T. Can someone come to the board and do the ones column.

S. (One student comes to the board)

$$\begin{array}{r} 438 \\ -\,296 \\ \hline 2 \end{array}$$

T. Now, look at the tens column, can we subtract 9 from 3.

S. No, 9 is bigger than 3.

T. Since the top number is smaller than the bottom number, we borrow 1 from the hundreds column. The 1 added to the tens column makes it 13.
Can someone come to the board and do the second column? Remember to subtract 1 from 4 since you borrowed 1 from the hundreds column.

S.
$$\begin{array}{r} {}^{3}\not{4}\,{}^{13}\not{3}\,8 \\ -\,2\;\;9\;6 \\ \hline 4\;2 \end{array}$$

T. Can someone come to the board and do the 3rd column?

$$\begin{array}{r} {}^{3}\not{4}\,{}^{13}\not{3}\,8 \\ -\,2\;\;9\;6 \\ \hline 1\;4\;2 \end{array}$$

Sample Dialogue

(Continued)

T. What is the difference between 438 and 296.

S. It is 142.

T. What is 438 take away 296.

S. It is 142.

Follow-Up

Students will come to the board to work out a problem while explaining to the others the steps that they are following to arrive at their solution.

Wrap-Up Dialogue

T. What do we call this type of subtraction?

S. It's called subtraction with regrouping.

T. When we see the words take away, difference, minus and subtract, do we +, -, x?

S. We subtract.

Follow-Up Activities

Given more subtraction problems on the board, the teacher will ask students to solve the problems on the board and verbally explain the procedure they followed to get their answers.

Given a set of numbers, students will be asked to identify the ones, tens, hundreds column.

Grade 3

OBJECTIVE

Given multiplication and division expressions, with parts of the expression designated, the student selects the word factor, product, quotient, dividend, divided by, or divisor to describe each of the designated parts.

Materials

Blackboard, flashcards with adherent, (flash cards have words from review vocabulary and development vocabulary) 4 or 5 smaller sets of flash cards (one for each student in the group)

ESOL LEVEL 4

High Intermediate

LINGUISTIC FOCUS

Review

Vocabulary

factor	product
times	answer
equals	

Development

Vocabulary

divided by	dividend
divisor	quotient

MATHEMATICS FOCUS

Review

2	X	6	=	12
(factor)	(times)	(factor)	(equals)	(product)

Students must name the mathematical term for each numeral and symbol in the above equation.

After each term has been identified, have the students read the equation using the mathematical term rather than the numeral or symbol. Ex. factor times factor equals product.

Development

16	÷	2	=	8
(dividend)	(divided by)	(divisor)	(equals)	(quotient)

students must name the mathematical term for each numeral and symbol in the above equation.

Sample Dialogue

T. Today we are going to learn some new words that we use when we divide. The words are:(affix the flash cards to the board as you say each one)

divided by	dividend	equals
divisor	quotient	

(point to each word and have the students repeat after you).

T. Let's look at a division problem. (write on board 16 ÷ 2 = 8)

If we were to write this problem out horizontally, it would look like this: (Write on board and explain. Have different students explain it in their own words.)

16	+	2	=	8
number being divided	what is being done	number doing the dividing	is the same as	answer
DIVIDEND	DIVIDED BY	THE DIVISOR	EQUALS	QUOTIENT

Write the following on the board and have different students explain each part of the problem by labeling each number and symbol with the corresponding flash cards used earlier.

$7\overline{)21}$ (3) $6 \div 3 = 2$ $4 \times 3 = 12$ $20 = 5 \times 4$

Follow-Up Activity

Distribute small flash cards - one for each student. Put on the board: (these are examples, more may be added)

$18 \div 6 = 3$ $6 \times 7 = 42$ $5\overline{)30}$ (6) $\begin{array}{r} 8 \\ \times\ 4 \\ \hline 32 \end{array}$

As teacher points to one part of one problem students are individually asked to hold up the flash card that describes the part indicated and then explain the other parts of the same problem.

Wrap-Up Game

Place all flash cards in a box. Call for a volunteer to go up to the box, pick a card, read it and write a sample problem in which he/she can place the flash card as a label for one of the numerals or symbols he/she has produced. Have the student explain step by step what he/she produces.

Grade 11

OBJECTIVE

The student will be able to divide a 5-digit whole number by a 2-digit whole number.

MATERIALS

Chalkboard, chalk, worksheets for students to work practice exercises.

ESOL Level 2

LINGUISTIC FOCUS

Review

Vocabulary

problem	subtract
go into	minus
equals	complete

Structures

Which is _____?

There is _____.

It's _____.

There are _____.

How many?

Development

Vocabulary

answer	dividend
whole numbers	divisor
remainder	quotient
place holder	minus
	digit

Can ____ (number) go into _____ (number)?

Yes,____ (number) can go into ____ (number).

No, ____ (number) can't go. into ____ (number).

Find out _____.

What is the next step?

It is _____.

MATHEMATICS FOCUS

1) Divide 27500 by 25

```
  1100
25)27500
  25
   25
   25
    000
```

2) 40 divided into 80040

```
  2001
40)80040
  80
   040
   40
    0
```

3) Divide 12848 by 26.

```
  494 R4
26)12848
  104
   244
   234
    108
    104
      4
```

SAMPLE DIALOGUE

Teacher writes the 1st problem on the board from the mathematics focus.

T. Divide 27500 by 25 is set up like this: (write on board)

Divisor $25\overline{)27500}$ Dividend

T. Can someone read this problem?

S. 27 thousand, 5 hundred, divided by 25.

T. The dividend is the number being divided - the number in the box.

Which is the dividend?

S. The dividend is 27500.

T. The divisor is the number that is dividing - the number outside of the box.

Which is the divisor?

S. The divisor is 25.

T. Can someone tell me what the dividend is?

S. The dividend is the number being divided.

T. And what is the divisor?

S. The divisor is the number that does the dividing.

T. Now, let's try to find the answer. Another word for answer in division is the quotient. What is another word for answer?

S. Quotient.

T. Can 25 go into 2?

S. No, 25 can't go into 2.

T. Can 25 go into 27?

S. Yes, 25 can go into 27.

T. How many groups of 25 can go into 27.

S. One.

T. The one is placed on top of the 7. (at this time you may point out that the answer is going to be a 4-digit number)

Where is the one placed?

S. The one is placed on top of the 7.

SAMPLE DIALOGUE

(continued)

T. 1 times 25 is 25. (stress: proper alignment of digits is necessary to avoid computational errors)

T. Next, we subtract - 27 minus 25. Who can explain the subtraction?

S. 27 minus 25 equals 2.

T. The next step is to carry down the next digit (5). What is the next step?

S. Carry down the next digit.

T. Once we do that we have to find out how many groups of 25 are there in 25.

T. Can someone tell me how many groups of 25 are in 25?

S. Yes, there is one group.

T. What is our next step?

S. We subtract.

T. Yes, what do we subtract?

S. 25 minus 25.

T. What is our answer?

S. 0.

T. When our answer is 0, our problem is completed, but we must fill in the rest of the spaces on top. How will we fill them?

S. With zeros.

T. The zeros are place holders. What are the zeros called?

S. Place holders.

T. (Problem is finished following the same steps as before)

These zeros are important. They are place holders. If we don't write them, our answer or quotient looks like 11, not 1100.

T. Let's try the first problem on your worksheet.

(After students finish this problem, follow the same procedure with problems #2 and #3 on the mathematics focus. Problem #2 emphasizes zeros in the middle of the answer and problem #3 emphasizes remainders.)

FOLLOW-UP ACTIVITY

Separate class into two groups and have each group write 10 division exercises like the ones worked in class. Have them exchange these and see which of the two groups obtains a higher score within the allotted time. (15 - 20 min.)

WRAP-UP DIALOGUE

T. Please take a look at the next problem on your worksheet. Tell me which is the dividend and the divisor.

S. The dividend is _____, the divisor is _____.

T. How do you set up the problem?

S. _____ goes under, _____ outside.

T. Let's work these exercises and we will check on the answers before the end of class.

Note: In order to successfully comprehend this exercise, student must know how to:

- compare fractions
- add two fractions with like denominators
- find equivalent fractions
- reduce fractions to lowest terms

Grade 5

OBJECTIVE

The student will find the least common denominator of two fractions.

Materials

Chalkboard, chalk, duplicating masters with fractions, flash-cards with fractions.

ESOL Level 4

High intermediate

LINGUISTIC FOCUS

Review

Vocabulary

different, same, denominator

numerator, common denominator,

multiple, equivalent, fractions

Development

Vocabulary

least common multiples

least common denominator

Structures

a) Which multiples are common to both fractions?

They are _____.

b) What is the lease common multiple of _____?

It is _____.

c) What is the least common denominator of ___ and ___?

It is _____.

d) The least common denominator is the same as _____.

e) The least common multiple is the same as _____.

MATHEMATICS FOCUS

1/2 + 1/3 = 3/6 + 2/6

(0, 2, 4, 6, 8...) (0, 3, 6, 9...)

3/6 + 2/6 = 5/6

Sample Dialogue

T. (Teacher reviews adding fractions with like denominators first, while pointing out to students that they have common denominators. Then writes the fractions with unlike denominators on the board.

T. 1/2 + 1/3 =

T. Look at these two fractions, can we also add them as they are?

S. No, the denominators are different.

T. When adding fractions, and the denominators are different, we must look for a common denominator before we add them. To find a common denominator, first, we list the multiples of each denominator, then choose the least common multiple (LCM) of both numbers. Next, we change each fraction to its equivalent, and then we perform the indicated operation. Now can someone come to the board and list the multiples and the denominator of the fraction 1/2.

S. (Student comes to the board) They are 0, 2, 4, 6, 8, 10, 12...

T. Who can list the multiples of the second fraction, 1/3?

S. (Student comes to the board) They are 0, 3, 6, 9, 12...

Sample Dialogue

(Continued)

T. Look at both sets of multiples. Which number is their least common multiple(LEP)?

S. It is 6.

T. The least common multiple is the same as the least common denominator. Can someone tell me what is the least common denominator of the two fractions.

S. It is 6.

T. Now that we've found the least common denominator, what we have to do is make the two fractions equivalent.

1/2 = __/6

+1/3 = __/6

The way we do this is, 1) we write the common denominator, 2) we find the missing numerators. The golden rule of fraction is: Whatever you do to the denominator, you must do to the numerator.
Can someone come to the board and help me do it?

S. (Student goes to the board)

T. To change the denominator from 2 to 6, what number do we multiply by?

S. We multiply by 3.

$(3) \times \frac{1}{2} = \frac{3}{6}$
$(3) \times \frac{1}{2} = \frac{3}{6}$

T. To change the denominator from 3 to 6, what do we multiply by?

S. $(2) \times \frac{1}{3} = \frac{2}{6}$
$(2) \times \frac{1}{3} = \frac{2}{6}$

T. Now, let's add the two fractions.

S. 3/6 X 2/6 = 5/6

Follow-Up Activities

A) Write fractions on cards or slips of papers. Have students pick two fractions and name their nultiples and least common denominator. The one that has the most correct wins. They could work in small groups.

B) Have students do word problems involving fractions that teacher has made or that are in their book.

Wrap-Up Dialogue

T. Can we add fractions with unlike denominators?

S. No, they must have the same denominators.

Wrap-Up Dialogue

(Continued)

T. What is the least common denominator?

S. It is the least common multiple of the fractions.

T. What is the golden rule of fractions?

S. We must do to the numerator whatever we do to the denominator.

OBJECTIVE

Grade 8

Identify a fraction that is equivalent to a given proper fraction having a denominator of 2,3,4,5,6,8, and 10.

Materials

Construction paper, string, colored pencils, scissors, rulers.

ESOL Level 3

Intermediate

LINGUISTIC FOCUS

Development

Vocabulary

fraction, equivalent, numerator, denominator, half(ves), third(s), fourth(s), fifth(s), sixth(s), eighth(s), tenth(s), multiply, why, what, because, same, top number, bottom number

Structures

_____ is equal to _____.

_____ is equivalent to _____.

The top number is the _____.

The bottom number is the _____.

Find the equivalent fraction of _____.

MATHEMATICS FOCUS

Ability to recognize equivalent fractions. When given a proper fraction and either a numerator or a denominator, the student will supply the other.

Ex. 4/5 = __/20, 3/4 = 6/__, __/5 = 4/10, 3/5= __/10.

Sample Dialogue

The top number is the numerator.
The bottom number is the denominator.

T. What is the top number?

S. The top number is the numerator.

T. What is the bottom number?

S. The bottom number is the denominator.

1/2 is equal to 2/4 because you multiply the numerator by the same number and you have an equivalent fraction.

Ex. $\frac{3}{4} \times 3 = \frac{9}{12}$

1/2 is equal to 2/4. 2/4 is an equivalent fraction.

T. What is equal to 1/2 of 1/2?

S. 2/4 is equal to 1/2.

T. Why is 1/2 equal to 2/4?

S. Because you multiply the numerator and the denominator by the same number.

Find the equivalent fraction of 1/4.

T. What is the equivalent fraction of 1/4?

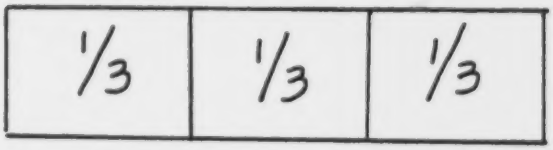
S. 2/8 is the equivalent fraction of 1/4.

ACTIVITIES

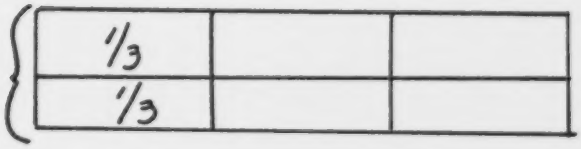
The teacher will write several fractions on the board with an equal sign after them. The teacher will say "1/2 is equal to 2/4. 2/4 is an equivalent fraction of 1/2", while writing 1/2 = 2/4 on the board. The teacher will ask what the equivalent fraction of 1/2 is and students will repeat chorally.

This exercise will be done with all the fractions written on the board. Students will answer chorally. After the exercise has been completed, students will make superimposed graphics of the fractions on the board. These fractions will be written in the graphic symbols.

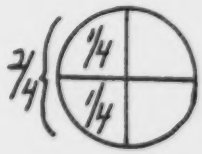
Ex. 1/3 = 2/6



2/6



Ex. 1/2 = 2/4



After graphics are constructed, each student can come up to the front of the room and present his/her problem with the graphic symbol. She/he will act the teacher's part while the rest of the class answers the problem and looks at the graphics.

Grade 8

OBJECTIVE

Add two proper fractions having unlike denominators of 2,3,4,5,6,8, or 10.

Materials

Construction paper cut outs of fractional parts; halves, thirds, fourths,fifths, sixths, eighths, tenths, twelfths, each a different color (8 colors) (You may wish to use commercially produced cut outs of these fractions.

20 - 3" x 5" index cards with a fraction written on each:

1/2, 1/2, 1/3, 2/3, 1/4, 3/4, 1/5, 2/5, 3/5, 4/5, 1/6, 5/6, 1/8, 3/8, 5/8, 7/8, 1/10, 3/10, 7/10, 9/10.

ESOL Level 4

High Intermediate

LINGUISTIC FOCUS

Review

Vocabulary

addition, equivalent, fraction numerator, denominator, half(ves), third(s), fourth(s), fifth(s), sixth(s), eighth(s), tenth(s).

Development

Vocabulary

common denominator

Structures

_____ is equal to _____.

_____ is equivalent to _____.

The denominator is _____.

The numerator is _____.

Can 3 be divided evenly by 2?

Can 8 be divided evenly by 4?

MATHEMATICS FOCUS

Changing fractions to equivalent fractions having a common denominator; expressing answers in lowest terms.

First review equivalent fractions:

2/4 is equivalent to _/2

2/3 is equivalent to _/6

1/4 is equivalent to _/12

2/3 is equivalent to _/12

17/12 is equivalent to 1 5/12

Sample Dialogue

After ample review of equivalent fractions, write a problem on the board such as: 1/2 + 1/4.

T. (pointing to 1/2) What is the denominator?

S. Two.

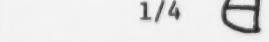
T. (pointing to 1/4) What is the denominator?

S. Four

T. Are they the same?

S. No, they are different.

T. Show me 1/2 with your paper fraction. Show me 1/4.

S. (Shows) 1/2 1/4 

T. How can I show the same amount as the 1/2 piece using fourths?

S. Use 2 fourths.

T. Yes, now I can add them together.

Show other examples using thirds and sixths; fourths and eighths; fifths and tenths; halves and sixths.

$$\begin{array}{r} \frac{2}{4} \\ +\ \frac{1}{4} \\ \hline \frac{3}{4} \end{array}$$

Next, show 1/2 and 1/3.

$$\begin{array}{r} \frac{1}{2} \\ +\ \frac{1}{3} \\ \hline \end{array}$$

39

59

T. Can I change 1/2 into something thirds? 1/2 = ?/3

S. (Using paper cutouts) No.

T. Can I change 1/3 into halves?

S. No.

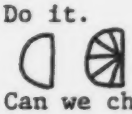
T. No, for this example we need to change both fractions to equivalent fractions that have the same denominator. Multiply the two denominators; 2 times 3 equals _____.

S. 6

T. Can we change 1/2 to sixths?

S. Yes.

T. Do it.

S.  1/2 equals 3/6.

T. Can we change 1/3 to sixths?

S. Yes 1/3 equals 2/6.

T. Now add

$$\begin{array}{r} \frac{3}{6} \\ +\frac{2}{6} \\ \hline \frac{5}{6} \end{array}$$

T. Let's make some rules about what we have done.

1. First ask, "Can the larger denominator be divided evenly by the smaller denominator?"

   The answer is yes, in these problems.

$$\begin{array}{r} \frac{1}{2} \\ +\frac{1}{4} \\ \hline \end{array} \qquad \frac{2}{3}+\frac{1}{6}=\frac{3}{10}+\frac{2}{5}= \qquad \begin{array}{r} \frac{3}{8} \\ +\frac{3}{4} \\ \hline \end{array}$$

   In each of these cases we will change only one fraction and leave the larger denominator as is.

$$\begin{array}{r} \frac{1}{2}=\frac{\ }{4} \\ \frac{1}{4}=\frac{1}{4} \\ \hline \end{array}$$

   Now we change the $\frac{1}{2}$ to fourths and add.

$$\begin{array}{r} \frac{1}{2}=\frac{2}{4} \\ \frac{1}{4}=\frac{1}{4} \\ \hline \end{array}$$

2. If the answer to number 1 is <u>no</u> as in:

$$\begin{array}{r} \frac{2}{3} \\ +\frac{3}{4} \\ \hline \end{array} \qquad \frac{1}{5}+\frac{3}{4}=\frac{1}{2}+\frac{2}{3} \qquad \begin{array}{r} \frac{3}{8} \\ +\frac{4}{5} \\ \hline \end{array}$$

Then we multiply the two denominators and use the product as the common denominator.

$$\frac{2}{3} \qquad \frac{2}{3} = \frac{\quad}{12} \qquad \frac{2 \times 4}{3 \times 4} = \frac{8}{12}$$

$$4 \times 3 = 12$$

$$+\frac{3}{4} \qquad \frac{3}{4} = \frac{\quad}{12} \qquad \frac{3 \times 3}{4 \times 3} = \frac{9}{12}$$

If you rewrite the problem horizontally you can use a short cut:

$$\frac{2}{3} + \frac{3}{4} \qquad \frac{(2 \times 4) + (3 \times 3)}{3 \times 4} \quad \text{or} \quad \frac{8 + 9}{12}$$

Multiply each numerator by the other denominator and add for the numerator.

Multiply the denominator for the denominator.

$$\frac{1}{5} + \frac{3}{4} = \frac{(1 \times 4) + (3 \times 5)}{5 \times 4} = \frac{4 + 15}{5 \times 4} = \frac{19}{20}$$

$$\frac{1}{2} + \frac{2}{3} = \frac{(1 \times 3) + (2 \times 2)}{2 \times 3} = \frac{3 + 4}{2 \times 3} = \frac{7}{6} = 1\frac{1}{6}$$

$$\frac{3}{3} + \frac{4}{5} = \frac{(3 \times 5) + (4 \times 8)}{40} = \frac{15 + 32}{40} = \frac{47}{40} = 1\frac{7}{40}$$

To do this method, the student needs a great deal of practice in changing fractions to lowest terms in the answer, but it eliminates the need for finding the lowest (least) common denominator which for some students is quite difficult.

Follow-Up Activity

Use the index cards described in the materials section. Students take turns drawing 2 cards, writing the problem on the board and solving it. There will be times when the denominators will be the same. Other times rule #1 or rule #2 will apply. This gives students all the opportunity to distinguish when to use each procedures.

Wrap-Up Dialogue

When adding fractions, we first have to look carefully at the problem. The first question we ask ourselves is "are the denominators alike?" If the answer is yes, we just add the numerators - the denominator stays the same: 1/5 + 2/5 = 3/5

If the answer is no, then we ask, "can the larger denominator be divided evenly by the smaller denominator?" 3/4 + 1/8

If the answer is 'yes', then we just change the smaller denominator:

3/4 + 1/8 = __/8 + 1/8

If the answer is 'no', then we multiply the two denominators and change both fractions to equivalent fractions:

$$\frac{2}{5} + \frac{3}{8} = \frac{16 + 15}{40} = \frac{31}{40}$$

$$\frac{16}{40} + \frac{15}{40} = \frac{31}{40}$$

Grade 11

OBJECTIVE

The student will be able to subtract two mixed numbers with denominators of 2, 3, 4, 5, 6, 8 or 10.

MATERIALS

Chalkboard, chalk, worksheet with exercises for students to practice.

ESOL Level 4

High Intermediate

LINGUISTIC FOCUS

Review

Vocabulary

numerator	divisible
denominator	check
equivalent	rename
common denominator	

Structures

What do we need to do?

We need to _____.

What is _____?

It is _____.

What are _____?

They are _____.

Development

Vocabulary

mixed number

simplify - simplest form

least common denominator

whole number

MATHEMATICS FOCUS

Review

1 whole unit is equivalent to:

1/1, 2/2, 3/3, 4/4, 5/5, etc.

2/3 is equivalent to 4/6, 6/9, 8/12, 10/15, etc.

Development

1) $43\frac{3}{4} = 43\frac{3}{4}$

$-\ 12\frac{1}{2} = 12\frac{2}{4}$

$31\frac{1}{4}$

2) $62\frac{1}{3} = 61\frac{28}{21}$

$-\ 21\frac{3}{7} = 21\frac{9}{21}$

$40\frac{19}{21}$

3) $23\frac{3}{5} = 23\frac{6}{10}$

$-\ 12\frac{1}{10} = 12\frac{1}{10}$

$11\frac{5}{10} = 11\frac{1}{2}$

SAMPLE DIALOGUE

(Teacher writes the 1st problem from the mathematics focus on the board)

T. Today's lesson requires the subtraction of two mixed numbers.

What are mixed numbers?

S. Mixed numbers are whole numbers and fractions.

T. Yes, we are going to subtract a mixed number from another, but first, we need to have common denominators.

T. Which is the smallest,divisible by both 4 and 2?

S. Eight.

T. We could use 8, but that's not the smallest. Does anyone have any other ideas?

S. Four.

T. Good, four is the least common denominator. Now we proceed as with addition. Remember the new number must be equivalent to the one we had.

Ex. $\frac{1}{2} \times \frac{2}{4}$ (4 and 4) (a quick check is to cross-multiply)

T. Once we have common denominators, we can subtract like this.

Ex. $\frac{3}{4}$ minus $\frac{2}{4}$ is $\frac{1}{4}$.

Are we finished?

S. No.

T. Right, we need to subtract the whole numbers.

Ex. 43 minus 12 is 31.

What is the answer?

S. 31 and $\frac{1}{4}$

T. Would someone like to try a problem at the board?

(Teacher then goes on to the 2nd problem from the mathematics focus)

T. Let's work this one the same way.

(Same steps are followed until students find that they are unable to subtract as before)

SAMPLE DIALOGUE

(continued)

T. We cannot subtract 9/21 from 7/21, can we?

S. No.

T. What we need to do is rename or regroup 62 7/21, so that our fraction is larger. Here's how we do it.

Remember that 1 whole can be renamed as 2/2, 3/3, 4/4, and so on.

Since we are working with 21 as our denominator, how many will there be in 1 whole?

$1 = \frac{}{21}$

S. 21.

T. Good, so we take one whole unit from the 62, leaving 61 and 21/21 that we just renamed and the 7/21 we had to begin with gives us how many?

S. 28/21.

T. Our problem now looks like this:

$$\begin{array}{r} 61\ \frac{28}{21} \\ -\ 21\ \frac{9}{21} \\ \hline \end{array}$$

Can you finish it? What is the answer?

S. 40 and 19/21.

T. Correct, try this one ...

(Teacher proceeds to the 3rd problem from the mathematics focus, this time stressing simplification as a final step)

FOLLOW-UP ACTIVITY

Divide students into two or three groups or teams, A student from each group comes to the board and works on a given problem. The winning team is the "tutor group" for the rest of the week, helping their classmates achieve this objective.

WRAP-UP DIALOGUE

T. What do we check for first when subtracting fractions?

S. A common denominator.

T. What is it called?

S. The least common denominator.

T. What if we cannot subtract?

S. We take a whole unit and rename it.

T. What is our last check?

S. Find out if it is in it's simplest form.

OBJECTIVE

Identify a decimal or percent equivalent to a proper fraction having a denominator of 10 or 100.

Materials

Index or flash cards, black magic markers, paper, rulers

ESOL Level 3

Intermediate

LINGUISTIC FOCUS

Review

Vocabulary

percent, multiply, decimal, interest, amount, charge, deposit, borrow

Structures

What is percent?

It's _____ (a part of one hundred)

_____ is equal to _____.

_____ is the same as _____.

MATHEMATICS FOCUS

Ability to state a decimal or percent equivalent to a given fraction with a denominator of 10 or 100.

Ex. 30/100 = .30 = 30%

8/10 = 80/100 = 80%

5/100 = 0.05 = 5%

Sample Dialogue

T. What do you do with money?

S. Student answers will vary.

T. What about extra money?

S. You put it in the bank.

T. Why?

S. Because of the interest.

T. Yes, when you deposit money, the bank gives you interest on the money deposited. This interest is a percent of that money. The same thing happens when you borrow money. Interest is charged. A percent or part of the money borrowed is charged by the bank. What is percent then?

S. Percent is part of the money you borrow.

T. Right. Percent is part of a hundred and it's shown with this sign - %. (Teacher writes % sign on board) What's a credit card?

S. Students will give different responses.

T. Where are they used?

S. Stores, restaurants, gas stations, beauty parlors, etc.

T. (Teacher will give examples of credit cards and bring some cards to class.)
How are credit cards used?

S. They are used to charge.

Sample Dialogue

(continued)

T. Ok, I have a problem for you.

T. Let's say that your parents go to Sears and charge $100. The interest is 22%. How much do your parents owe Sears?

S. 22% of $100.

T. Correct. To find out what your parents owe, multiply 22/100 X 100/1. (Teacher will reinforce and point out how to write 22% as a fraction.) What's the answer?

S. 22 (Twenty-two)

T. 22 plus the hundred dollars charged equals $122. That's what Sears will charge for $100. Let's review now! What's percent?

S. A part of a hundred.

T. Who can come to the board and write the sign?

S. (Student writes % sign)

T. Good. When do we use percent?

S. When we charge, deposit, borrow money.

T. What do we do to find percent?

S. We multiply.

T. What do we multiply?

S. We multiply the percent amount by the money, and we add both numbers.

T. Fine. We know what percent is and how to write it. Ex. 22/100 = 22% (Teacher writes example on board.) Now we'll learn how to change 22% to a decimal. Remember, we said that percent was what?

S. A part of a hundred.

T. Yes, cent means one hundred. How many places are there in 100?

S. Two.

T. Ok, so to change a percent to a decimal, we move back two places because 100 has two places. Ex. 22% = .22 = .22 (Teacher illustrates and points as he/she writes examples on the board until percents and decimals have been understood by students.) 22% is equal to .22.

Activities

1. Using index cards prepared by students with the teacher's supervision, the students will flash the card they possess which is equivalent to the fraction the teacher calls out as he/she writes it on the board. For example, the teacher will call out "32/100" as he/she writes the fraction on the board. The class will look at the cards they have (distributed before activity). The student(s) having the equivalent, either in percent (32%) or in decimal (.32) will flash them as they show them to the rest of the class. Then they'll go to the board and finish what the teacher started - 32/100 = 32% = .32, as they say it to the class.

Activities

(Continued)

2. Using regular paper, students will copy the following chart written by the teacher on the board.

Ex.

Fractions	Decimals	Percent
9/100	____	____
____	____	30%
____	.25	____
____	____	8%
____	.22	____

This chart will be used with ten or twenty numbers for practice. The teacher will always provide the students with one blank, and the students will fill in the other two blanks. When they finish, the teacher will call out individual students to come to the board and fill in the blanks. If necessary, they will explain the procedures used to the rest of the class.

Note: Before introducing this skill, it is assumed that the students have been exposed to fractions.

Note: In order to successfully complete this lesson, student should have mastered:
- Identify digits in the tenths, hundredths, or thousandths place.
- Compare any two decimals

Grade 5

OBJECTIVE

Student will round decimals to the nearest whole number

Materials

Chalkboard, chalk, duplicating masters with decimals.

ESOL Level 3

Intermediate

LINGUISTIC FOCUS

Review

Vocabulary

decimals, fraction, whole number, ones, tenth, hundredth, thousandth, less than <, greater than >, place, value

Development

Vocabulary

rounding, nearer to, nearest, exactly halfway between, between

Structures

a) 13.51 is between what whole numbers?

It is between 13 and 14.

b) 13.51 is nearer to what number?

It is nearer to 14.

c) What is 13.51 rounded to the nearest whole number?

It is 14.

MATHEMATICS FOCUS

Development

a) Round to the nearest whole number.

3.4 = 3
13.51 = 14
243.68 = 244

Sample Dialogue

Teacher writes a set of numbers on the board and asks students to round them to the nearest ten. For example:

728 = 700 5983 = 6000

Teacher writes sets of decimals on the board.

3.4 = 13.51 = 243.68 =

T. When we are rounding decimals to the nearest whole number, the first thing we do is 1) find out which whole numbers it is between. Can someone tell me between which whole numbers is 3.4?

S. It is between 3 and 4.

T. 2) We look at the digit which is in the tenth's place. If it is 5 or greater, we round up. If it is less than 5, it stays the same. In 3.4, which number is in the tenth place?

S. 4 is in the tenth place.

T. Do we round up or stay the same?

S. It stays the same.

T. What is 3.4 rounded to the nearest whole number?

S. It is 3.

T. Teacher follow same procedure for the other exercises.

Follow-Up Activities

Teacher gives 10 numbers and asks students to name the place value of each underlined numeral.

Wrap-Up Dialogue

T. When do we say that a number is in the tenth's place?
When do we say that a number is in the hundredth's place?
When do we say that a number is in the thousandth's place?

T. Which number is exactly halfway between 0 - 100?

S. It is 50.

T. Which number is exactly halfway between 2 and 3?

S. It is 2.5.

T. 453 is nearer to what numbers?
Is it 4, 45, 400, 500?

S. It is nearer to 500.

OBJECTIVE

The student will be able to divide two numbers, each having no more than two decimal places.

Materials

Chalkboard, chalk, worksheet with practice exercises for students

ESOL level 4

high intermediate

Grade 11

LINGUISTIC FOCUS

Review

Vocabulary

whole number	numerator
decimal	denominator
dividend	power
divisor	equivalent
	divisible

Development

Vocabulary

Algorithm

MATHEMATICS FOCUS

Review

(Multiplication by powers of 10)

$35.3 \times 100 = 3530$

$4.54 \times 10 = 45.4$

$300 \times 10 = 3000$

Development

1) Dividing a decimal by a whole number

$$\begin{array}{r} 10.32 \\ 15\overline{)154.80} \\ \underline{15} \\ 048 \\ \underline{45} \\ 30 \\ \underline{30} \\ 0 \end{array} \qquad \frac{154.80}{15}$$

2) Dividing a decimal by a decimal

$$\begin{array}{r} 4.44 \\ 4.5\overline{)19.9.80} \\ \underline{18\ 0} \\ 1\ 9\ 8 \\ \underline{1\ 8\ 0} \\ 1\ 8\ 0 \\ \underline{1\ 8\ 0} \\ 0 \end{array} \qquad \frac{19.98}{4.5} \times \frac{10}{10} = \frac{199.8}{45.}$$

3) Dividing a whole number by a decimal

$$\begin{array}{r} 603\ 00 \\ .06\overline{)3618.00} \\ \underline{36} \\ 018 \\ \underline{18} \\ 0 \end{array} \qquad \frac{3618}{.06} \times \frac{100}{100} = \frac{361800}{6}$$

SAMPLE DIALOGUE

Teacher should first review multiplication by powers of 10 and emphasize the position of the decimal point before and after the multiplication is performed.

T. Now that we have reviewed multiplication by powers of 10, we can use the skill to divide decimals.

Let's review the pattern or algorithm for division.

(Teacher writes problem #1 from mathematics focus)

T. Can we write this problem as a fraction? Can someone come up to the board and show us how it can be done?

S. $\frac{\text{Dividend}}{\text{Divisor}}$ Ex. $\frac{154.80}{15}$

T. What is the number on top of the line called?

S. It is the dividend.

T. What is the number under the line called?

S. It is the divisor.

T. If there are no decimal places in the divisor, we can divide it as it is. Can someone come up to the board and solve this problem? (Call on student)

T. What is the final step we must take care of when we have finished the problem?

S. We must place the decimal point in the correct place.

T. Where does the decimal point belong?

S. Right above where it is, but in the answer.

T. What is the answer?

S. 10.32.

T. Try this one.(Problem #2 from the mathematics focus)

(Students are instructed to work on this problem individually)

Write it as a fraction

Ex. $\frac{19.98}{4.5}$

T. Are there any decimals in the denominator?

S. Yes.

SAMPLE DIALOGUE

(continued)

T. If we need to change the denominator to a whole number, what do we do?

S. We multiply by 10.

T. That's correct. Please do this on your papers.

$$\frac{19.98}{4.5} \times \frac{10}{10} = \frac{199.8}{45}$$

T. If we multiply the denominator by 10, what must we do to the numerator?

S. Multiply by 10.

T. Notice how our problem has changed. It is now - (writes on board)

$$\begin{array}{r} 4.44 \\ 45\overline{)199.80} \\ \underline{180} \\ 198 \\ \underline{180} \\ 180 \\ \underline{180} \\ 0 \end{array}$$

T. If you have a remainder, you must add a zero and divide again.

T. Check the decimal point. Where should it be?

S. Between the first and second 4.

T. Try this one. (Problem #3 on the mathematics focus)

Ex. $.06\overline{)3618}$

How do we write it as a fraction?

S. $\frac{3618}{.06}$

T. What is our next step?

S. We multiply by $\frac{100}{100}$

T. That gives us what equivalent fraction?

S. $\frac{361800}{6}$

T. Work it out and give me your answer.

S. 60,300

T. Very good, now try the problems on your worksheet.

FOLLOW-UP ACTIVITY

Give students 10 exercises similar to the ones shown, and have them work these problems without writing them as fractions first.

WRAP-UP DIALOGUE

T. What do we need to do before we divide?

S. We need to clear the decimal in the divisor.

T. How do we do this?

S. By changing the problem into a fraction and multiplying the denominator and the numerator by 10.

T. Then we divide as usual.

T. What should we check for, after we divide?

S. The decimal point.

T. Where should it be?

S. Above the one in the dividend.

INSTRUCTIONAL ORIENTATION II: WORD PROBLEMS

LESSON GUIDES

Objective

Kindergarten - 1st grade

Interpret problems, +, -, :
Oral stories for pictures, $\leq$ 10.
[P2.74]

Materials

Picture of store window showing 7 or 8 items with price tags. Tags should only read $5 or $3, $2, etc. - no decimals.

Play money - enough for each student to have 10 one dollar bills.

Several small items: candy bars, pencils, erasers, stickers, etc. also labled $3, or $4, etc.

Linguistic Focus

Review

Vocabulary

more, less, how many, have, dollars

Development

Vocabulary

How much, money, costs, candy bar, sticker, eraser, price tag, etc.

Structures

This is a/an _____. It's a/an _____.

This cost _____. It cost_____.

How much money does it cost?

How much money do you have left?

How many dollars do you have?

I have _____ dollars.

It costs _____ dollars.

Mathematics Focus

The students will be able to determine how many dollars they have left $\leq$ 10 after they have paid for an object.

Introduction

T. Look at this picture. It's a store. It has many things in the window. Let's name some things.

T. This is a candy bar. It's a candy bar. What is it?

S. It's a candy bar.

T. This is an eraser. It's an eraser. What is it?

S. It's an eraser.

Teacher goes through this procedure until all objects have been identified and named. Then the same procedure is repeated to give the prices for all the objects.

T. The eraser costs $3. It costs $3. How much does it cost?

S. It costs $3.

T. The pencil costs $5. It costs $5. How much does it cost?

S. It costs $5.

Teacher then asks a student to come up to the "store" with his/her $10 and choose something to buy.

T. How much does it cost?

S. It costs $7. (giving teacher $7)

T. How much money do you have left?

S. I have $3 left.

This procedure should be repeated until all objects in picture have been <u>bought</u> and all students have practiced paying and counting change.

Follow-Up Activity

Teacher should put all objects with price tags on desk. A student should be asked to come up and be salesperson. The salesperson will call on another student. The student called up will pick an object. The salesperson will say:

SELLER: This _____ costs $3.

Give me $3.

How much money do you have left?

BUYER: I have $7 left.

(student will get to keep the object)

Students should be alternated taking turns as buyers and sellers.

Wrap-Up Dialogue

Using objects on table.

T. I have $10. This candy bar costs $2. (Puts $ on table)
How much money do I have left?

S. You have $8 left.

T. This sticker costs $9. (Puts $ on table)
Juanito, how much money do I have left?

S. You have $1 left.

To be repeated with at least 7 or 8 students.

Sample Dialogue

Review

The teacher will hold up ten one dollar bills and say, I have ten dollars. I want to buy a pencil. It costs $4. (teacher counts the $4 and sets them on table)

T. How many dollars do I have left?

T. I have $6 left. I have less money left.

T. Class, I have $10. The pencil costs $4. How many dollars do I have left?

S. You have $6 left.

T. I have less money left.

Grade 3

OBJECTIVE

Given a real world situation, the student develops a pictograph to represent the situation with symbols less than or equal to ten whole units.

ESOL Level 3

Intermediate

LINGUISTIC FOCUS

Vocabulary

Review

commic books

information

Development

pictograph key
graph stands for

MATHEMATICS FOCUS

Review

Have students count by 2's to 20, by 5's to 50, and by 10's to 100.

Development

Put on board:

Games played

Joe	0 0 0
Bill	0 0 0 0 0

key: each 0 stands for 5 games

Sample Dialogue

T. Does anyone know what we call this kind of graph?

S. It is a pictograph.

T. What is a pictograph?

S. A pictograph is a graph that uses pictures.

T. What does this pictograph tell us?

S. It tell us how many games Joe and Bill played.

T. Can anyone read the pictograph to me? (Students are encouraged to answer in their own words.)

T. I am going to make another pictograph that tells how many comic books these children read.

Write: Jennifer - 6
Jackie - 14
Tommy - 10
Stephen - 12

Key: Each stands for 2 books.
(book)

Comic Books Read

T. We are going to record the information we have on a graph. What does the key tell us?

S. It tells us that 1 stands for 2 books.

T. Do we have enough information to fill in the graph?

S. Yes.

T. Who can explain the first thing we must do, and then do it?

S. First we must find out how many books Jennifer read. (Student goes up to the board, finds out the number of books read, and writes the appropriate number of in the graph. Student explains process he/she goes through in order to get answer.)

T. Who can come up to the board and explain how many books Tommy read and how many (pictures) need to be placed on the graph? (Call another student to come up to the board. Encourage the student to verbally explain his/her process. Continue calling on different students until the entire graph has been filled out.)

T. Who read the most books?

S. Jackie read the most number of books.

T. Who read the least number of books?

S. Jennifer read the least number of books.

T. Who read twelve books?

S. Stephen read twelve books.

Follow-Up Activity

Write on the board a pictograph about some books for a book inventory. Let the students copy it and work independently on their pictograph.

Write:

Grade one - 100
Grade two - 90
Grade three - 120
Grade four - 110

Key: 1 stands for 10 books.

Before letting the students begin their independent work, ask them:

1) What information do we write on the left side? (the groups)

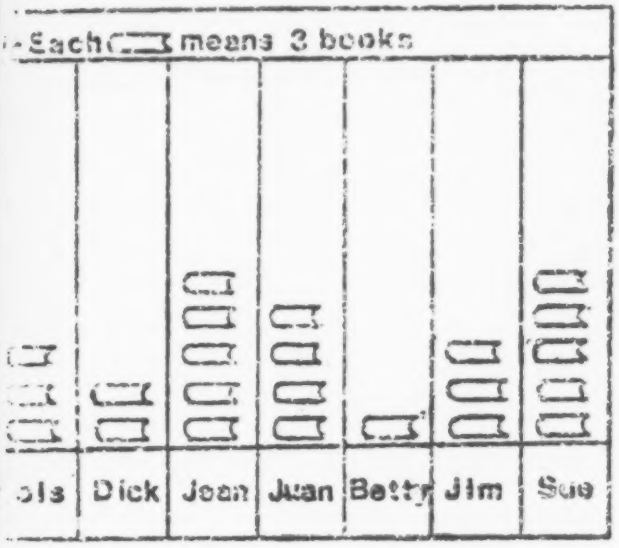
2) What information do we write on the right side? (the number in each group)

3) What does the key tell us? (how many each picture stands for)

After the students have finished their pictograph, call on volunteers to come up to the board and fill in the graph. Encourage verbal explanation of results.

The student will read and determine relationships described by pictographs expressed in whole units and simple tables.

Use this picture for the next 2 problems.



How many books did Juan read?

(A) 4

(B) 16

(C) 8

(D) 12

How many more books did Dick read than Betty?

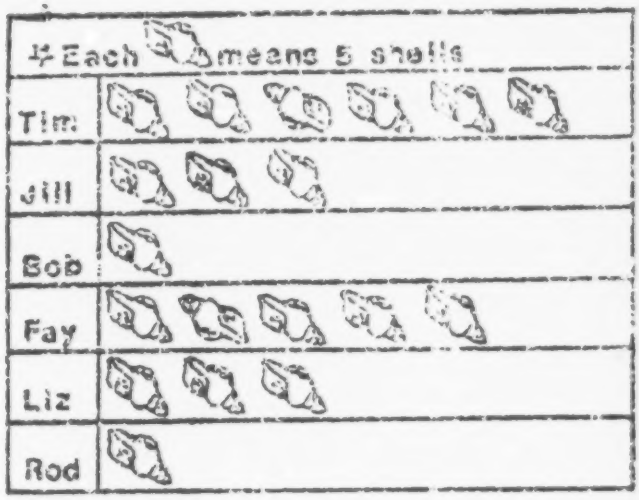
(A) 4

(B) 3

(C) 1

(D) 2

Use this picture for the next 3 problems.



3. How many shells did Tim find?

(A) 6

(B) 18

(C) 30

(D) 12

4. Who found 5 shells?

(A) Jill and Liz

(B) Tim

(C) Fay

(D) Bob and Rod

5. How many more shells did Fay find than Jil

(A) 2

(B) 10

(C) 15

(D) 25

Grade 8

OBJECTIVE

Translate a one-step real world problem into the appropriate number sentence.

Materials

Chart or ditto with one-step word problems requiring addition, subtraction, multiplication or division for solution. These may be teacher developed or taken from textbooks.

5" x 8" index cards with typed or carefully written word problems representing each of the four operations. You may want to put boxes instead of numbers, so that the student concentrates on the key words and the operation needed to solve.

Four 3" x 5" cards for each student; one each of +, -, x, and ÷.

ESOL Level 3

Intermediate

LINGUISTIC FOCUS

Review

Vocabulary

plus, minus, times, divided by, equals, addition, subtraction, multiplication, division, more, many, less, fewer, left, total, difference, change, remain, needed, each, per

Development

Vocabulary

number sentence, operation, solution, key words, solve

Structures

How many more?

How many fewer?

How many needed?

How much?

What is the difference?

How much less?

How many in (on) each?

How many in all?

We use _____ to solve this problem. (add, subtract, multiply, divide)

MATHEMATICS FOCUS

The focus for this objective should be in identifying the key words in a word problem that will help to tell what operation is necessary for solution.

First review the four operations having students repeat after the teacher, chorally, then as individuals.

Ex: 13 + 7 = 20

S. Thirteen plus seven equals twenty.

T. What operation is used?

S. Addition.

T. What sign tells us to add?

S. (Student points to plus sign.)

Repeat the same procedure for subtraction, multiplication and division.

32 x 6 = 192

20 - 7 = 13

56 ÷ 7 = 8

Sample Dialogue

After oral reading and choral reading of word problems from the chart or chalk board, have a student come to the board (of chart) and underline the key words that will determine what operation should be used for solution.

Ex: Sandy and Andy collected sea shells. Sandy found ____ shells. Andy found ____. How many did they find in all?

T. What does the question ask?

S. How many in all.

T. What do we need to do to answer the question?

___ + ___ = ___

___ - ___ = ___

___ X ___ = ___

Sample Dialogue

(continued)

S. Add ___ + ___ = ___

Now go back and put numbers in each of the boxes to complete the problem.

Now look at this problem:

There were 20 boxes in the warehouse. Each box had 24 cans in it. How many cans were in the warehouse?

Same problem using the word 'per'. There were 20 boxes in the warehouse with 24 cans per box. How many cans in all?

T. The word each in the problem tells us to _____(multiply).

S. Each in the problem tells us to multiply. Have students repeat this sentence.

Try another problem.

Manny and Danny were to pack 120 candies in 8 boxes. How many candies will they put in each box?

T. What are the key words?

S. How many; in each.

T. The word each in the question tells us to _____(divide).

S. The word each in the question tells us to divide.

120 ÷ 8 = 15

Go over problems that use all of the different common words used in word problems. (Those listed in the vocabulary section). Although some word problems are not as clearly written as the examples, a large percentage of test items can be solved by identifying key words.

Follow-Up Activity

Use the word problems written on the 5" X 8" index cards and have the students work in pairs, taking turns in reading the problem (on at least the key words) and showing the correct operation1 card (+, -, X, ÷). You may want to have the correct number sentence on the back of the card for self checking.

Wrap-Up Dialogue

Whenever we see word problems, we should try to find familiar words that will help us decide whether to add, subtract, multiply, or divide. I will read a question you tell me where to write it.

\+ - X ÷

How many left? How many in all? What is the difference? How many in each? How much change?, etc.

Write the questions under the proper headings.

(1) Sound Advice must sell 876 Elton John hit records. 320 were sold today. How many more records must Sound Advice sell?

(2) Debra sold 5 stacks of Super Bowl tickets. There are 212 tickets in each stack. How many tickets did Debra sell?

(3) Peggy likes baseball cards. She has 4 boxes filled. It takes 235 cards to fill a box. How many cards does Peggy have?

(4) McDonald's Hamburger Stand sold 524 hamburgers on Monday. How many burgers must be sold on Tuesday to make a total of 900 burgers sold?

(5) Raul scored 521 points at the Northwestern Track meet. Jose scored 237 points. How many more points did Raul score than Jose?

(6) Mary sold 4 cases of Girl Scout cookies. There are 107 cookies in each case. How many cookies did Mary sell?

(7) Tommy saved 6 books of S & H green stamps. There are 150 stamps in each book. How many stamps in all?

(8) Meadowlark Lemon set a season record of 236 points. "Wilt the Stilt" made 186 points. How many points will Wilt need to make to tie Meadowlark?

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Grade 3

OBJECTIVE

Given word problems using addition, subtraction, multiplication, or division, with and without sufficient information to solve the problem, the student selects a number sentence or indicates that it cannot be done.

ESOL Level 2

LINGUISTIC FOCUS

Review Vocabulary

child
children
balloons
apples
give away

Development Vocabulary

rows	per	comic books
trees	find out	spend
solve	cost	spent
answer	price	missing

Structures

How many _____?

How much _____?

How many left _____?

What is the _____ thing?
(first, second, third)

What does it say?

It says that _____.

How much money did he spend?

He spent _____.
(? cents)

What do we know?

We know that _____.

What do we want to know?

We want to know _____.

MATHEMATICS FOCUS

Write the following problems on the board:

Review

1) 24 apples
6 per child
How many children?

2) 6 rows
7 per row
How many trees?

3) 14 balloons
6 given away
How many left?

4) 9 comic books
Given 4 more
How many comic books?

Sample Dialogue

T. Listen while I read the first problem on the board out loud. Listen for key words that will help you answer the questions. (read the problem)

T. The first thing the problem says is that there are 24 apples. What is the first thing the problem says?

S. It says that there are 24 apples.

T. The second thing the problem says is that each child gets 6 apples. There are 6 apples per child. What is the second thing the problem says?

S. There are 6 apples per child.

T. The problem asks how many children there are. What does the problem ask?

S. The problem asks how many children there are.

T. What two things do we know about this problem?

S. We know that there are 24 apples.

S. We know that there are 6 apples per child.

T. What do we want to know?

S. We want to know how many children there are.

T. Who can solve this problem?

(student goes up to the board and solves problem)

T. Can you explain what you did to get the answer? (Give the student the option to verbalize his/her process. Encourage but do not insist on oral explanation of results.)

Follow the above procedure for each problem on the board.

MATHEMATICS FOCUS

DEVELOPMENT

Write the following on the board:

1) Bob bought a car for 45¢, a pack of paper for 50¢, and a box of pencils.

   How much did he spend?

2) Our friends had a neighborhood sale. Each child brought 3 items to sell.

   How many items in all?

Sample Dialogue

T. Read the first problem on the board silently whil I read it out loud. Listen for key words that will help you answer the questions. (read problem)

T. What is the first thing that the problem says?

S. The problem says that Bob bought a car for 45¢.

T. What is the second thing the problem says?

S. The problem says that he bought a pack of paper for 50¢.

T. What is the third thing the problem says?

S. The problem says that he bought a box of pencils.

T. What question does the problem asks? What do we want to know?

S. How much did he spend.

T. What information do we have? What do we know?

S. Bob spent 45¢ for the car and 50¢ for paper.

T. What do we want to know?

S. How much did he spend?

T. What must we do to get the answer?

S. Add.

T. What will we add?

S. 45¢ + 50¢ .

T. What is missing?

S. The price of the box of pencils.

T. Can we solve this problem?

S. No.

T. What must we do in order to be able to solve it?

S. We must find out how much he spent on the box of pencils.

T. Will someone come up to the board and solve this problem by telling me the price of the box of pencils?

(Student comes to board, supplies price and solves problem)

T. Can you explain what you did to get the answer? (Give student the option to verbalize his/her process. Encourage but do not insist on an oral explanation of results.)

Follow the above procedure for the second problem on the board.

More Practice The following problems can be used to give students additional practice. This can be done in a large or small group instructional situation. Students must decide whether or not the problem can be solved with the information given. If yes, they will solve it. If no, they will supply the information needed to solve the problem.

1) There were 34 children at the park, 15 more came.

How many in all?

2) Harry had 50¢. He bought 2 ice cream cones.

How much change did he get?

3) Rita had 16 dolls. She received some more dolls for her birthday.

How many in all?

4) There were 48 jars of paint.

How many jars in each box?

5) There were 8 tables full of children.

How many children in all?

Independent Activity

Have students work in groups of 3 to develop word problems with insufficient information. Each group may choose the operation (+. -, -, X), 1 problem per group. When they have finished, they may exchange their papers, and try to solve another groups'problem by supplying the information and performing the operation necessary.

Grade 5

OBJECTIVE

Given word problems requiring multiplication or division for solution, the student interprets the problems and selects the appropriate equation.

ESOL LEVEL III

Intermediate

LINGUISTIC FOCUS

Review

Vocabulary

solve	story problem
answer	multiplication
division	operations

Development

Vocabulary

find out	in all
in each	verify

Structures

How many in all?

How many were there?

There were _____.

What is the _____(first, second, third).

Thing we must do to solve the problem.

The first thing we must do is _____.

What is the _____(first, second, third).

Question we ask.

What do we already know?

We know that _____.

MATHEMATICS FOCUS

Development

Write multiplication and division word problems on the board. For example.

There were 7 boxes.

8 oranges in each box.

How many oranges in all?

Mother had 54 cookies.

There were 9 cookies on each tray. How many trays were there?

T. We need to read each of these story problems very carefully to decide what is to be done to solve them. Read the first problem silently as I read it out loud. Listen carefully for key words which will help you solve the problem. (Read problem out loud)

T. Now read the problem to yourselves. Again, pay close attention to the key words which will help you decide what you need to do to solve the problem. (Allow time for students to read)

T. What is the first question we ask about a story problem?

S. We ask what do we want to know.

T. What do we want to know?

S. We want to know how many oranges in all.

T. What do we already know?

S. We know that there are 7 boxes, and 8 oranges in each box.

T. What do we have to do to find the answer?

S. We have to find out what the key words are.

T. What are the key words?

S. The key words are, in each, in all.

T. What do these words tell us to do?

S. Multiply.

T. All right. Can someone come up to the board and write a number sentence to fit the story problem?

S. 7 X 8 = 56

T. Can someone come up and explain how the number sentence was developed?

S. 7 boxes times 8 oranges in each box equals 56 oranges.

T. Is our answer correct?

S. Yes.

T. Can someone come up to the board and draw a picture that will verify our answer?

S. Goes to the board

Follow same questioning strategy for the second problem.

Follow-Up Activity

Write the words multiply and divide on the board. Have the students number their papers from 1 to 10. As you read simple story problems which require multiplication or division for solution, the students are to write the word Multiply or Divide beside that number to indicate which operation could be used to solve the problem.

Wrap-Up Dialogue

T. When we are asked to solve word problems, what are some of the things which we must do? (Answers will vary.) Encourage students to respond such things as:

- we must read every word carfully to find out just what we are being asked to do
- we must ask what do we need to know
- we must ask what do we need to do to find the answer
- we must make sure we can verify the answer
- we must look for key words that will help us decide what operation to use

Grade 5

OBJECTIVE

Student will learn how to estimate (+, -)

Materials

Paper money, coins, chalkboard, chalk

ESOL Level 3

Intermediate

LINGUISTIC FOCUS

Review Vocabulary

pennies, money, dime, quarter, half-dollar, buy, numbers, nickel, about, all together, how much left, how much spent, any, total, more than.

Development Vocabulary

about how much, about how many, items, estimate

Structures

1. About how much?
   It is _____.
2. About how many?
   It is _____.
3. How much left?
   It is _____.
4. How much spent?
   It is _____.

MATHEMATICS FOCUS

T. I will read the problem with you while you read silently.

For her allowance, Nadine received $1.25 from her mother. She wants to buy some items for herself and her friend Carl, and save the rest. She estimates that she should have enough money to buy:

- Gum for a dime.
- Candies for a quarter.
- Paper for 50¢.
- Potato chips for 25¢

a) About how much will she spend all together?

b) About how much will she have left?

Sample Dialogue

T. How much money did Nadine receive?

S. She received $1.25.

T. Why did she receive the money?

S. For her allowance.

T. What does she want to do with the money?

S. She wants to buy some items, and save the rest.

T. What are these items?

S. They are gum , candies, paper and potato chips.

T. How much does she estimate that the gum will cost?

S. It will cost a dime.

T. What is a dime?

S. A dime is 10¢.

T. How much does she estimate that the candies will cost?

S. They will cost a quarter.

T. What is a quarter?

S. A quarter is 25¢

Sample Dialogue

(Continued)

T. How much does she estimate that the paper will cost?

S. It will cost 50¢.

T. Is 50¢ a dime, a quarter or a half-dollar?

S. It is a half-dollar.

T. How much does she estimate that the potato chips will cost?

S. They will cost 26¢.

T. Let's find out about how much money she might have to spend. What do we do? Do we add, subtract, multiply or divide?

S. We add the total of the items.

T. .10 + .25 = .50 = .26 = $1.11.

T. If Nadine has $1.25, and will spend $1.11, how do we find out how much she has left. Do we add, subtract, multiply of divide?

S. We subtract $1.11 from $1.25.

T. Can someone come to the board and do the subtraction?

S.
$$\begin{array}{r} \$1.25 \\ -\ 1.11 \\ \hline \$0.14 \end{array}$$

T. If Nadine had 14¢ left, about how much money does she have left? Is it about a dime, a quarter, a half-dollar or a dollar?

S. It is about a dime.

T. Why?

S. Because a dime is $.10, and $.14 is closer to $.10 than to a quarter or a half-dollar.

Follow-Up

Given a newspaper with sales coupon, students will be asked to cut-out enough coupons to get about a dollar discount on groceries.

Wrap-Up Dialogue

T. What is a half-dollar?

S. A half-dollar is 50¢.

Wrap-Up Dialogue

(Continued)

T. Is 50¢ and $.50 the same?

S. Yes, they are.

T. Is 50¢ more than a dime?

S. Yes, 50¢ is more than a dime.

T. Teacher follows the same procedure for the rest of the problem.

Grade 3

OBJECTIVE

Given word problems involving purchases of 2 to 4 items totaling less than $10.00, the student writes the number sentence and finds the solution.

ESOL - LEVEL 2

LINGUISTIC FOCUS

Review Vocabulary

buy	hotdogs
bought	potato chips
cake mix	frosting
bring	money
brought	word problem

Development Vocabulary

cost	price
spend	number sentence
paper goods	

Structures

What do we want to know?

We want to know _____.

What is the _____.
(first thing, second thing, third thing.)

How much did he/she spend?

He/she spent _____.

How much did it/they cost?

It/they cost _____.

MATHEMATICS FOCUS

Review

Write the following problems on the board.
Review solving the problems and discuss the amount of money involved in each.

$ 2.16	$ 5.00	$ 9.00	$ 1.29
3.24	- 1.59	- 8.17	1.29
+ 3.10			+ 1.29

Development

Develop word problems which include more than 2 items to add or subtract. The student must write the number sentences that will enable him/her to solve the problem. Examples are given.

1) We bought hotdogs for $1.69, rolls for $0.85, and potato chips for $1.19. How much money did we spend?

2) Sue wanted to make cupcakes. She paid $2.08 for cake mix and $1.78 for frosting. How much did she spend?

3) Jim brought the paper goods. He paid $1.69 for paper plates, $0.89 for cups, and $0.67 for napkins. How much did they cost?

4) Bob and Lois brought the drinks. They paid $1.85 for milk, $1.72 for orange juice, and $1.49 for lemonade. How much money did they spend?

SAMPLE DIALOGUE

T: Today we are going to do some word problems about money. Read problem number one silently, while I read it out loud. Listen for the key words which will help you solve the problem. (teacher reads problem out loud)

T: What is the first thing the problem says?

S: The problem says we bought hotdogs for $1.69.

T: What is the second thing the problem says?

S: The problem says we bought rolls for 85 cents.

T: What is the third thing the problem says?

S. The problem says we bought potato chips for $1.19.

T: What do we want to know?

S: We want to know how much money did we spend.

T: Who can tell me the number sentence for this word problem?

S: $1.69 + $0.85 + $1.19 = ?

T: Who wants to come to the board and write the number sentence for this word problem and solve it?

S: Student comes up to the board and writes:

$$\begin{array}{r} \$1.69 \\ 0.85 \\ +1.19 \\ \hline \$3.73 \end{array}$$

T: Let's go on to problem number 2. Read the problem silently,while I read it out loud. Listen for the key words which will help you solve the problem. (teacher reads problem out loud)

T: Can anyone tell me in his/her own words what the problem says? (This is encouraged by the teacher, but not demanded. If no student responds, the teacher may restate for the benefit of the students.)

T: What do we want to know?

S: We want to know how much did she spend.

T: Who can write the number sentence for this problem and solve it?

S: Student comes up to the board and writes.

$$\begin{array}{r} \$2.08 \\ +1.78 \\ \hline \$3.86 \end{array}$$

FOLLOW-UP ACTIVITY

Pair students up in groups of 2. Have them work on the last two problems on the board. Read the problems to them, while they read them silently. Let them write the number sentences for the problems and then solve them. Remind them of placement of digits. When they have finished, let them express their answers by restating the problem in their own words and solving the problems on the board.

WRAP UP DIALOGUE

T: What did we do with all of our money problems today?

S: We added prices.

T: What do we have to look for when we add prices?

S: Keeping the numbers in the right places.

T: What must we remember when adding money?

S: To keep all the $ signs and decimal points under each other.

The student will determine the solution to real-world problems involving three purchases totaling less than one dollar and addition or subtraction with change from a five dollar bill.

Directions: Solve each problem. Choose the best answer.

Store Prices	
gum	15¢
popcorn	40¢
candy bar	25¢
ice-cream cone	30¢

Jean bought a candy bar and gum at the store. How much did she spend?

(A) 10¢

(B) 40¢

(C) 25¢

(D) 70¢

3.

Store Prices	
soap	13¢
fruit	27¢
soup	23¢
bread	29¢

Mary bought bread, soup, and fruit at the store. How much money did she spend?

(A) 52¢

(B) 27¢

(C) 79¢

(D) 16¢

4.

Store Prices	
hamburger	.35¢
hot dog	.75¢
french fries	.60¢
soda	.25¢

John bought french fries and a soda. How much change should he get from $5.00?

(A) $2.45

(B) $5.85

(C) $4.15

(D) $2.55

Store Prices	
pen	.65¢
paper	.49¢
crayons	.85¢
ruler	.30¢

Jesse bought a pen at the store. How much change should he get from $5.00?

(A) 35¢

(B) $5.65

(C) 65¢

(D) $4.35

5.

Store Prices	
puzzle	49¢
ball	25¢
jacks	40¢
comic book	30¢

Bob bought 2 puzzles at the store. How much change should he get from $5.00?

(A) 93¢

(B) $4.51

(C) 49¢

(D) $4.02

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Grade 8

OBJECTIVE

Solve real-world problems involving comparison shopping for purchases less than $10.

Materials

Supermarket flyers, newspaper advertisements from food section, department store flyers, construction paper, colored pencils.

ESOL Level 3

Intermediate

LINGUISTIC FOCUS

Development
Vocabulary

shopping, sales, flyers, newspapers, most, least, unit price, compare, spend, item, advertisement.

Structures

Which is the best buy?

What do _____ (you, we I) _____ (do, buy)?

Compare two items and prices.

MATHEMATICS FOCUS

Ability to solve problems which require the comparison of items for purchases less than $10.

Sample Dialogue

T. Who goes shopping with Mom?

S. Answers from students.

T. What do you buy?

S. Answers will vary.

T. When you go to the store to buy paper, candy, etc., do you have any idea of what the cost is?

S. Answers will vary.

T. Ok, let's find out what we do when we buy something. We'll read the following problems together. (Teacher reads it out loud while students read silently.)

PROBLEM:

If 7 pencils cost 35¢ and 10 pencils are on sale for 40¢, which is the best buy?

T. What is the problem about?

S. Money, buying pencils.

T. What does the problem say?

S. It says that 7 pencils cost 35¢ and 10 pencils cost 40¢.

T. To find out what the best buy is, we have to find the unit price of pencils. In other words, we have to find the price of one pencil.

T. What is unit price?

S. The price of one pencil.

T. Yes, in this problem, it's pencils. In other problems, it can be notebooks, fruits, clothes, books, etc. These things are called items.

T. What are pencils?

S. Items.

Sample Dialogue

(Continued)

T. Books? Notebooks? Fruits? Clothes?

S. Items.

T. Very well, Now, let's find the price of one item. If we know that 7 cost 35¢, what do we do to find what one item costs?

S. We divide.

T. Who can come to the board and show us what we divide?

S. Student goes to the board and writes as he/she says - $7\overline{)35}$ "Divide thirty-five by seven".

T. What's the answer?

S. Five.

T. So, 5¢ is the unit price of a pencil - an item.
And we found the unit price by doing what?

S. Dividing the money (price) by the items.

T. Ok, we know that one pencil costs 5¢ and 7 cost 35¢. We also know that 10 pencils are on sale for 40¢. What do we do now?

S. Find out the unit price of the item.

T. How do we do that?

S. We divide money by items.

T. Fine, let's do it. Who can come to the board and divide?

S. Student goes to the board and writes as he/she says - $10\overline{)40}$ "Divide forty by ten".

T. Good. What's the answer?

S. Four.

T. Yes, what is four?

S. Four is the price of one pencil.

T. Right, it's the unit price of an item. We have both unit prices. Now we compare.

Teacher writes on board - 7 pencils cost 35¢ - Unit price 5¢
-10 pencils cost 40¢ - Unit price 4¢

T. We want to buy the most number of items for the least amount of money. Let's compare.

Teacher writes on board and points at unit prices while asking.

T. 7 pencils @ 5¢ each or 10 pencils @ 4¢ each. Which is the best buy?

S. 10 pencils for 40¢.

Activities

1. Ask students to write down prices they see at the supermarket when they go shopping and bring them to school.

   Ex. 3 - 7 oz. cans of tuna for $2.00 and 1 - 9 oz. can of tuna $1.75.

   With the information brought to class, the teacher can develop word problems and ask students to work them out individually. First, they do the problems on their own papers and then they solve them on the board explaining to the class what procedures they used.

2. The teacher will ask students to make money (coins and bills up to $10.00) with construction paper. The teacher will distribute flyers and newspaper advertisements (previously brought to class by students). He/she will also distribute paper money and instruct the class to look for prices, figure out the unit price, and compare to find out which is the best buy. They will also write all the items bought with the money given by the teacher. When the activity is completed, each student will present to the class what he/she bought and the procedures necessary to obtain his/her best buys.

Wrap-Up Activity or Dialogue

The teacher will discuss with the class what was done in each one of the above activities. He/she will ask questions and encourage students' responses, but should allow students to talk as much as possible. In this manner, the teacher will get immediate feedback about the lesson taught.

Note: In order for the student to effectively master this skill, he/she must have previous knowledge of liquid measurement and working with decimals.

Grade 11

OBJECTIVE

The student will be able to solve real-world problems involving comparison shopping.

MATERIALS

Chalkboard, chalk, newspaper advertisements, worksheet with additional problems.

ESOL Level 3

Intermediate

LINGUISTIC FOCUS

Review

Vocabulary

shopping

better/best

cheaper/cheapest

expensive

least expensive

most

ounces

Development

Vocabulary

compare

comparison

unit price

advertisement

quantity

total cost

MATHEMATICS FOCUS

1) Clean Hair Shampoo comes in four sizes. Which is the best buy?

a) 8 oz for $1.59

b) 10 oz for $1.63

c) 16 oz for $1.98

d) 20 oz for $2.49.

Unit pricing

a) $8\overline{)1.59}$ = .199

b) $10\overline{)1.63}$ = .163

c) $16\overline{)1.98}$ = .124

d) $20\overline{)2.49}$ = .125

SAMPLE DIALOGUE

(Teacher distributes newspaper advertisements and worksheets with sample problems.)

T. According to _____ Discount Store, this brand of shampoo comes in four different sizes. What are the sizes?

S. 8 ounces, 10 ounces, 16 ounces, and 20 ounces.

T. We want to compare the prices of each of these sizes to see which size will give the most shampoo for the least amount of money. We can't do this with the sizes and prices the way they are, because they give us different quantities.

We must find out the unit price; in this case, the cost of one ounce of shampoo.

To do this, we divide the total cost by how many ounces there are in each bottle. What do we do?

Ex. a) $8\overline{)1.59}$

S. We divide.

T. What do we divide?

S. The total cost of the shampoo by how many ounces there are in each bottle.

T. Can someone come up and write the problem out for us on the board? (Student comes up and writes what is in the example above)

T. What is our answer?

S. 0.199.

T. We do the same for each one. Do the same for b.(Student comes up to the board.)

What is the answer?

S. The answer is 0.163.

T. Do the same for c. (Student comes up to the board.)

What is the answer.

S. The answer is 0.124

T. Do the same for d. (Students comes up to the board.)

What is the answer?

S. The answer is 0.125

T. Now that you have the unit price or the cost of one ounce for each bottle, you can compare. Which is the cheapest or least expensive?

SAMPLE DIALOGUE

(continued)

S. The 16 ounce bottle.

T. The 16 ounce bottle is the best buy.

FOLLOW-UP ACTIVITY

Same activity can be extended to other items. A variety of problems should be included - involving discounts, unit pricing, buy three-get the fourth item free, etc.

WRAP-UP DIALOGUE

T. Do we just look at the total price when comparing?

S. No.

T. What do we need to consider?

S. We need to find the unit price.

T. What does finding the unit price mean?

S. Finding the cost of one unit.

Grade 11

OBJECTIVE

The student will solve a problem by determining the elapsed time between two events stated in seconds, minutes, hours, days, weeks, months, or years.

MATERIALS

Chalkboard, chalk, a bus schedule for every two students, worksheet of sample problems.

ESOL Level 4

High Intermediate

LINGUISTIC FOCUS

Review

Vocabulary

a.m.

p.m.

difference

clues

rename

Structures

What do we need?

We need _____.

Development

Vocabulary

schedule

arrival

departure

elapsed time

coming from

going to

set up

MATHEMATICS FOCUS

Development

1) Joseph arrived at the bus station at 8:45 a.m. How long does he have to wait for the next bus to Orlando?

8:45 a.m. to 10:15 a.m.

```
 9:75
10:15
- 8:45
------
 1:30   answer
```

8:45 a.m. to 1:20 p.m.

```
11:60
12:00          3:15
- 8:45        +1:20
------        -----
 3:15          4:35   answer
```

SAMPLE DIALOGUE

(Teacher distributes the bus schedules and worksheets to students and writes problem from mathematics focus on the board)

T. Read the problem silently while I read it out loud. Listen for key words that will help you solve the problem. (Students read silently.)

Now read the problem again silently and look for clues that will help you answer the question. (Students read silently.)

Is there any information missing?

S. Yes. The time that the bus leaves to Orlando.

T. Good, use the bus schedule and tell me which column I should look under, arrivals or departures. Is he coming from Orlando or going to Orlando?

S. He is going to Orlando.

T. Then we look at the departures. What time is shown for the Orlando bus.

S. 10:15 a.m.

T. O.K., our problem then is to find out how many hours and minutes there are between 8:45 a.m. (morning) and 10:15 a.m. (morning). How can we find the difference in time?

S. Subtract.

T. Correct. Set up your problem like this.

```
 9:75
10:15
- 8:45
```

Can we subtract forty-five minutes from 15?

S. No.

T. We take one hour and rename it in minutes. How many minutes in one hour?

S. 60 minutes.

T. The 60 minutes plus the 15 minutes we had, gives us how many minutes?

S. 75 minutes.

T. Now, we can subtract. (Emphasize the fact that hour/minute "barrier" cannot be crossed unless you have made correct conversion) What is the answer?

S. 1 hour and 30 minutes.

SAMPLE DIALOGUE

(continued)

T. Correct, Joseph has to wait 1 hour and 30 minutes for a bus to Orlando.

Try this one. Suppose Maria arrived at the station at the same time (8:45 a.m.), but wants to go to Jacksonville. How long does she have to wait?

T. What information do we need?

S. We need the time for the bus to Jacksonville.

T. Yes, the departure to Jacksonville is at what time,

S. 1:20 p.m.

T. So what do we need to know?

S. How much time from 8:45 a.m.(morning) to 1:20 p.m. (afternoon).

T. What's different about this problem?

S. The one before was from a.m. to a.m. This one is from a.m. to p.m.

T. If they are both a.m. (morning) or both p.m. (afternoons), we just subtract.

But, if one is a.m. (morning) and the other p.m. (afternoon), here is how to solve it.

First, we find out the time until 12:00 (noon) by subtracting.

```
 11:60
 12:00
- 8:45
------
  3:15
```

Can you work it? (Encourage student to verbally express while working problem)

S. There are 3 hours and 15 minutes.

T. Yes, but this is just until noon. We take this answer and add it to the hour and 20 minutes in the afternoon.

```
  3:15
+ 1:20
------
  4:35
```

T. What is the answer?

S. The answer is 4 hours and 35 minutes.

T. Right, try the third problem on your worksheet.

FOLLOW-UP ACTIVITY

Same lesson should be developed using airplane schedules and/or calendars. This way students obtain the practice needed in solving elapsed time problems and practice their table/chart reading skills as well.

WRAP-UP DIALOGUE

T. We have worked two different problems dealing with elapsed time.

T. #1 a.m. to a.m. What do we do if they are alike?

S. Subtract first time from second time.

T. #2 a.m. to p.m. What do we do if they are different?

S. Subtract the first time from 12:00 and add the second time.

Grade 11

OBJECTIVE

The student will be able to solve problems related to length, width, or height, using metric units and converting units within the system.

Materials

Chalkboard, chalk, chart for metric conversions, worksheet with sample problems.

ESOL Level 3

Intermediate

LINGUISTIC FOCUS

Review

Vocabulary

Conversion	Solve
Metric	Problem
Unit	Largest
Width	Smallest
Key Words	Prefix

Structures

How many?

What must we do?

We must _____.

How do we _____?

Development

Vocabulary

kilometer	centimeter
hectometer	millimeter
decameter	stack
meter	method
decimeter	

MATHEMATICS FOCUS

1) Juan is asked to stack a pile of boards with widths of 6.2 cm, 132 mm, 55.3 cm, and 0.52 m in width. How high will the stack be, in meters?

T. Read problem silently while I read it out loud. (Read problem) Now, read it again silently. Look for key words which will help you solve the problem. Notice that all units are not the same.

km hm dam [m] dm cm mm

In metric conversions, decimal point is shifted in the same direction and the same number of units.

SAMPLE DIALOGUE

Teacher writes problem from mathematics focus on the board.

T. There are 4 different units in this problem. Can someone give me examples of units from this problem?

S. Centimeter, millimeter, meter.

T. We can't solve this problem the way it is. We must do something to the units. Can someone tell me what we must do?

S. We must change all the units to the same unit.

T. Yes. Here is a simple method.

Write these prefixes in order from larges to smallest.

kilo meter hecto meter deca meter [meter] deci meter centi meter milli meter

6.2 cm

T. Take the first unit in the problem, 6.2 cm and write it under the proper column.

To what unit do we need to change?

S. To meters.

T. In which direction do you find meters?

S. To the left.

T. How many units, or columns to the left?

S. 2 columns to the left.

T. Now, the decimal point is shifted 2 positions to the left.

What does that give me?

S. .062

T. Correct, 6.2 cm is equivalent to .062 m.

Can you do the second conversion?

S. Yes, the answer is .32 m

T. Good, try the third.

S. The answer is .553 m

T. Do we need to change the last one?

S. No, it is in meters.

SAMPLE DIALOGUE

(continued)

T. How do we finish the problem?

S. We add the units together.

T. Remember to line up the decimal point.

S. The answer is _____.

T. Good, try the other problems.

FOLLOW-UP ACTIVITY

This same mathematics focus should be used to extend the activity to solving problems requiring conversions using metric units of capacity and of mass.

WRAP-UP DIALOGUE

T. In order from largest to smallest, what are the metric prefixes that we used in this lesson?

S. Kilo, hecto, deca, unit, deci, centi, milli.

T. Do you think you can handle any metric conversion using this chart?

S. Yes.

T. Then, let's work the problems on your worksheet. Be careful with the units.

Grade 8

OBJECTIVE

Solve real world problems involving addition or subtraction of 4-digit numbers.

Materials

Sample word problems, either teacher made or taken from textbooks.

ESOL Level 3

Intermediate

LINGUISTIC FOCUS

Review Vocabulary

addition, subtraction, question words as listed in structures section.

Development Vocabulary

key words, solution

Structures

How many?

How many more, less, fewer, remain, needed, left.

How much more, less, etc.?

How much change?

What's the total?

What's the difference?

MATHEMATICS FOCUS

To determine whether addition or subtraction is needed to solve word problems.

Sample Dialogue

When writing word problems for students, try very hard to make them meaningful, relevant and whenever possible, using students names. By personalizing the problems, students are more apt to try to solve them.

For example: Carlos, Jose, Maria, Juan and Raphael got on the elevator. Their weights are 128, 116, 103, 142 and 135. What is their total weight?

T. What is the question in this problem?

S. What is their total weight?

T. What is the key word?

S. Total.

T. What does the key word tell us to do, add or subtract?

S. Add.

Have a student do the computation on the board, explaining each step.

Present a word problem for which subtraction is used for solution.

For example: At last Saturday's football game there were 1,942 people in attendance. In 1982 there were 2,132 people when the same teams played. How many more people went to the game in 1982?

T. What is the question?

S. How many more people went to the game in 1982?

T. What are the key words?

S. How many more.

Sample Dialogue

(Continued)

T. What is the question?

S. How many more people went to the game in 1982?

T. What are the key words?

S. How many more.

T. What do these key words tell us to do?

S. Subtract.

T. Which numbers do we subtract?

S. 1,942 and 2,132.

Many times,when students see more than 2 numbers in a problem, they figure they must add. It is important that they recognize that in a problem like this, it is talking about people, so we are only interested in the two numbers that tell how many people.

T. When our problem tells us to subtract, we must remember to write the larger number, in this case, 2,132 first, and subtract the smaller number.

Have a volunteer write the problem on the board and work it, being careful to regroup when necessary.

$$\begin{array}{r} 2,132 \\ -\ 1,942 \\ \hline 190 \end{array}$$

T. What does 190 represent?

S. There were 190 more people at the game in 1982.

Follow-Up Activity

Have students make up addition and subtraction word problems and write them on 5" x 8" index cards. Then they can exchange cards and work them. A simple format may be used, so that they can practice some of their vocabulary. Give the following sets of numbers for them to choose from to write the problems:

365	1,492	320
180	1,776	452
		389

Ex. There are 365 days in a year. We go to school 180 days. How many days remain?

Save the better ones for use at another time or for review.

Wrap-Up Dialogue

Today we have been working with word problems. Word problems can be made easier if we learn to look for key words. These words help us to know whether to add or subtract.

I will read a question, you tell me whether to add or subtract.

Read questions found in the structures section, and have students answer ADD or SUBTRACT in unison.

Note: In order for student to successfully acquire this skill, he/she must have mastered addition, subtraction, multiplication, and division of fractions.

GRADE: 5

OBJECTIVE

Given two or three-step word problems involving any of the four basic operations, the student selects the solution.

MATERIALS

Chalkboard, paper money, coins, price list, visuals of ingredients for use in problem.

ESOL Level 2

LINGUISTIC FOCUS

Review

Vocabulary

pound (lb.)	answer
sugar	milk
ounce (oz.)	can
each	ingredients
spend	items
plus	spent
minus	multiply
equal	divide
fifth	all together
1/6 (sixth)	

Structures

How much did he/she spend?

He/she spent _____.

How much left?

There is _____.

How many?

There are _____.

What is the _____ (first, second, third) thing?

The problem says?

The problem says_____.

What do we need to do?

We need to _____.

MATHEMATICS FOCUS

Review

Write on board:

There are 720 students in Fair Crest Elementary. 1/6 of the students are in the fifth grade. How many students are in the fifth grade?

T. Read the problem silently while I read it out loud. Listen for key words that will help you answer the questions. (Read problem)

T. I will read the problem again. Pay close attention to those key words that will help you answer the questions. (Read problem)

T. We want to find out how many students there are in the fifth grade. What do we want to find out?

S. How many students there are in the fifth grade.

T. The first thing the problem says is that there are 720 students in Fair Crest Elementary. What is the first thing the problem says?

S. There are 720 students.

T. The second thing the problem says is that 1/6 of the students are in the fifth grade. What is the second thing the problem says?

S. 1/6 of the students are in the fifth grade.

T. We want to find out how many students there are in the fifth grade. What do we want to find out?

S. How many students there are in the fifth grade.

T. Who can come up to the board and write the number sentence for this problem? (call on student)

S. 1/6 X 720/1 = ?

T. (To student at board) Can you read the problem? (Encourage but do not force a response)

S. (Reads problem)

T. Who can come up to the board, solve this problem, and explain the answer?

S. $\frac{1}{6} \times \frac{720}{1} = \frac{720}{6} = 120$

T. So, how many students are there in the fifth grade at Fair Crest Elementary?

S. There are 120 students.

T. (Write on board) There were 60 children on the playground. They were divided into 5 equal groups. Two of these groups played kickball against each other. How mary children played kickball?

T. This problem is a little different because there are more steps to solve. Read the problem to yourselves, while I read it out loud. Listen for key words that will help you answer the questions. (Read problem)

T. Now, I will read the problem again out loud. Listen again carefully to find out what you have to do to solve the problem. (Read problem)

T. We want to find out how many children played kickball. What do we want to find out?

S. How many children played kickball.

T. In order to get this answer, we need to know how many children are on a team. What do we need to know in order to get the answer?

S. We need to know how many children are on a team.

T. Do we know how many children there are on a team?

S. No.

T. What do we have to do to find this out? Can someone come up to the board and write what we have to do?

S. Writes $60 \div 5 = \underline{\quad ? \quad}$

T. What does the number 60 refer to?

S. There are 60 children on the playground.

T. What does the number 5 refer to?

S. The children were divided into 5 groups.

T. Who can come up to the board and write the answer to the first problem?

S. $60 \div 5 = 12$

T. Does this answer tell us how many students played kickball?

S. No.

T. What do I do with 12 to find out?

S. Multiply 12 times 2 groups who played kickball against each other.

T. How many children played kickball?

S. 24 children played kickball.

T. Many times we must solve problems that require even more than 1 or 2 steps. In the problem we just finished, we had to divide to find out how many children on each team, and then multiply to find out how many children played kickball. Let's look at this problem:

(Write on the board)

Devon earned $15 last week babysitting. This week she earned $10. She bought 3 record albums for $6 each. How much money does she have left?

Follow the procedure above to solve this problem with the students.

Follow-Up Activity

Write the following problems on the board. Let students solve them in groups of 2 or 3. Ask them to come to the board and show their work. Always read each problem out loud before the students begin to work on them.

A farmer has 15 rows with with 12 apple trees in each row. He has picked the apples off 68 trees. How many apple trees does he still have left to pick?

Danny's book has 323 pages. He read 43 pages on Monday; 54 on Tuesday; and 75 on Wednesday. How many pages does he have left to read?

Grade 5

OBJECTIVE

Given word problems involving addition or subtraction of like fractional numbers, multiplication of any fractional numbers, or any of the four operations with decimals, the student selects the answers.

Materials

Chalkboard, chalk, paper, pencils
fraction games chart with the following questions written on it:

Questions to ask when solving word problems

1. What do we want to know?
2. What information do we need?
3. What do we do to find the answer?
4. What information do we have?
5. Does the answer make sense?

ESOL Level 4

High Intermediate

LINGUISTIC FOCUS

Review Vocabulary

operation	altogether
solve	in all
word problem	

Structures

How many?

How much?

Development

Vocabulary

equation
clue
clue words
make sense

Structures

What do we want to know?

We want to know _____.

What information do we need?

We need _____.

What do we do to find the answer?

We _____.

What information do we have?

We _____.

Does the answer make sense?

MATHEMATICS FOCUS

Review

Write on board:

$$3\frac{4}{5} + 2\frac{2}{5} = 6\frac{1}{5} \qquad 5\frac{1}{6} - 2\frac{5}{6} = 2\frac{1}{3} \qquad \frac{4}{9} \times \frac{3}{7} = \frac{4}{21}$$

$$3\frac{1}{2} \times 4\frac{2}{5} = 15\frac{2}{5}$$

Call on different students to come to the board and work the examples, explaining steps.

Development

Write on the board:

Alicia rode her bike 3 3/4 miles on Tuesday, 2 2/4 on Wednesday, and 3 miles on Thursday. How many miles did she ride in all three days?

SAMPLE DIALOGUE

T. Read the problem on the board silently as I read it out loud. (Read problem)

T. I will read the problem again. Watch for key words which will give you clues to the answer to the question. (Read the problem)

T. Who can tell me in his/her own words what the problem says? (Encourage response from students)

T. (Hold up chart) Here are the questions we need to ask ourselves to help us solve this problem. What is the first question?

S. What do we want to know?

T. Who can answer that question?

S. How many miles Alice rode in three days.

T. What is the second question?

S. What information do we need?

T. Who can answer that question?

S. We need the number of miles Alice rode each day.

T. What is the third question?

S. What do we do to find the answer?

T. Who can answer this question?

S. We must add all of the miles she rode.

T. Are there any clue words?

S. Yes.

T. What are they?

S. In all.

T. What is the fourth question?

S. What information do we have?

T. Can someone answer this question?

S. We know how many miles Alice rode each day.

T. (Have student come to the board and find the answer. Encourage student to explain answer in his/her own words.)

SAMPLE DIALOGUE

(continued)

S.
$$\begin{array}{r} 3\frac{3}{4} \\ 2\frac{3}{4} \\ +\ 3 \\ \hline 9\frac{1}{4} \end{array}$$

T. Does the answer make sense?

S. Yes.

T. (Write these examples on the board and follow the same procedure to solve them.)

Randy wants to make cookies. The recipe calls for 3 1/4 cups of flour. Randy has 1 3/4 cups of flour. How much more flour does Randy need so he can make the cookies?

Leroy drank 2 1/2 glasses of milk yesterday. His father drank 1 2/3 times more milk than Leroy. How much milk did Leroy's father drink?

Follow-Up Activity

Write the following examples on the board and have students write the equation and the answer. Encourage verbal discussion of results.

Mrs. Rogers is making curtains for her living room. She has 9 3/8 yards of material. She used 7 5/8 yards. How many yards of material does she have left?

Liz's mother had 2 3/4 apple pies before her guest arrived. Her guest ate 2/3 of the pies. How much pie did her guest eat?

Steve read 2 1/3 books last week and 1 2/3 books this week. How many books did he read altogether last week and this week?

Wrap-Up Dialogue

T. (Hold up chart) When we solve word problems, here are some clues to remember. (Go over each of the steps)

T. Can someone read the questions out loud? (Call on different students)

Remember there are clue words to help us decide which operation to use. What are some of these clue words? (Encourage responses. Answers may vary)

Examples: Altogether, in all, how many, for addition

More, left, different, for subtraction of, each, for multiplication.